NAVY CIVIL
Engineer
Spring/Summer 1985

NAVFAC enters the COMPUTER GRAPHICS AGE

Story on page

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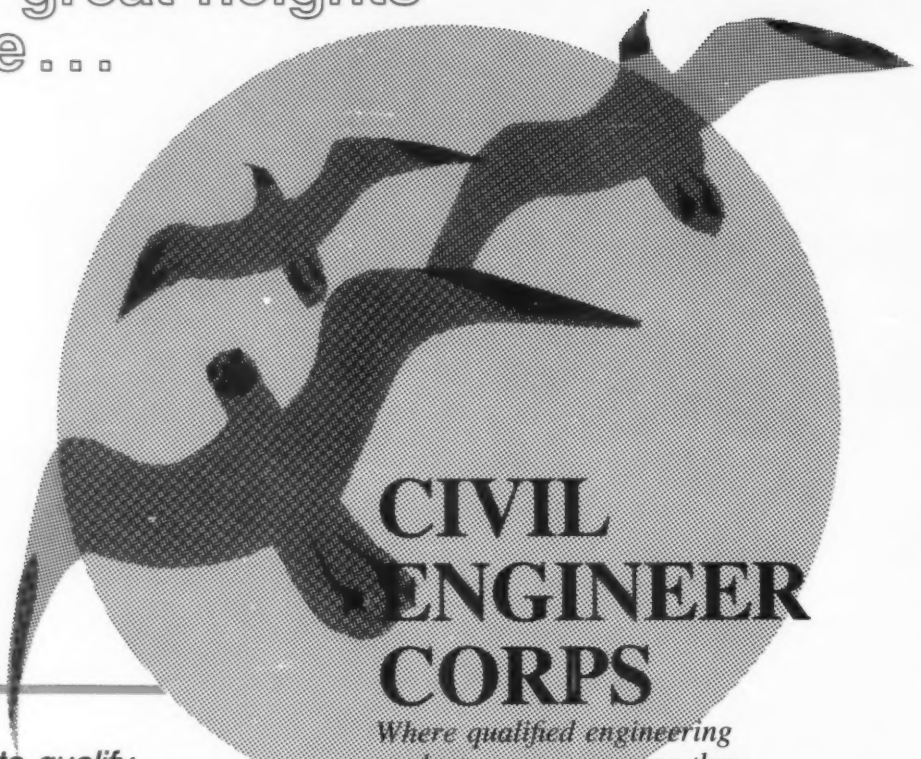

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THE COVER

Computer graphics has come of age at the Naval Civil Engineering Laboratory at Port Hueneme with equipment now installed at 14 locations. Staff artist Joy Ardalan's sketch shows a facilities planner creating an image at the GEMS workstation.

NAVY CIVIL Engineer

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GEMS: NAVY ENTERS COMPUTER AGE WITH GRAPHIC EQUIPMENT INSTALLED AT 14 LOCATIONS

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The Naval Facilities Engineering Command (NAVFAC) has entered the computer graphics age with a firm commitment. It is developing for the Navy a Graphics Engineering & Mapping System (GEMS), formerly the Graphics Design System, as a major tool to increase planning, engineering, and design productivity, saving time and money.

Use of the system within the NAVFAC community is relatively new but is already paying off. One recent example is an urgent design project for pier utilities at Mayport, Fla., completed in four hours by NAVFAC's Southern Division. It would have taken engineers at least a week to complete the same project using manual procedures.

NAVFAC installed its first system two years ago. Today, GEMS equipment is installed at 14 locations: NAVFAC Headquarters, the six Engineering Field Divisions (EFDs), five Public Works Centers (PWCs), the Naval Civil Engineering Laboratory (NCEL), and the Civil Engineering Support Office.

Last winter, approximately 45 planners, engineers, and

ABOVE: A facilities planner creates an image at the GEMS color workstation.

architects participated in a NAVFAC-sponsored GEMS symposium at Alexandria, Va. Although the major focus was on the development of methods to increase productivity, considerable attention was given to engineering design methods, and a general philosophy regarding use of the system.

GEMS features three-dimensional models which designers use to visualize complete facilities. The models contain sufficient data to enable engineers to use Computer-Aided Design (CAD) techniques to develop or analyze such components as structural, HVAC, piping, or electrical systems. Three-dimensional map models can be used by the planner or designer to visualize the existing or planned environment for the facility being designed. GEMS also affords users the capability to develop drawings from the same model used in the design or planning process.

Hardware and software for this system have been procured as part of the Navy's Computer-Aided Engineering Program (CAEP). The program has provided Computer-Aided Engineering and Documentation Systems (CAEDOS) to 78 Navy sites, including laboratories, shipyards, and air rework facilities as well as the NAVFAC GEMS locations.

This cohesive advantage provides a large number of Navy activities with completely compatible equipment, allowing users within the navy to share easily data bases and experiences.

Basic hardware components being used are 16- and 32-bit minicomputers and associated peripherals such as workstations, tape drives, disk drives, and plotters. A typical workstation consists of a video display, a keyboard, an electronic pen, and a digitizing tablet with a command menu area and a drawing area. Both color graphics workstations and monochrome workstations with large size digitizing tablets are used.

The computers run Computer-Aided Design and Drafting System Version 4X (CADDS 4X) graphics software. In addition to the basic graphics software, there are specialized CADDS 4X software packages; General Building Design, Area Information Management (used for space management and thematic mapping), Site/Civil Engineering, Digital Terrain Modeling, Global Mapping System, Steel Detailing, etc. The software is complemented by user-developed features such as custom tablet command menus, screen command menus, symbol libraries, and programs.

Within the NAVFAC Engineering and Design Divisions, the primary application of GEMS is in-house design of facilities and production of construction drawings. For NAVFAC Planning and Real Estate Divisions, the application is computer-aided mapping for maintenance of Existing Conditions Maps and Real Estate Summary Maps, and for analytical support of planning studies such as installation master plans and land management plans.

Three dimensional models

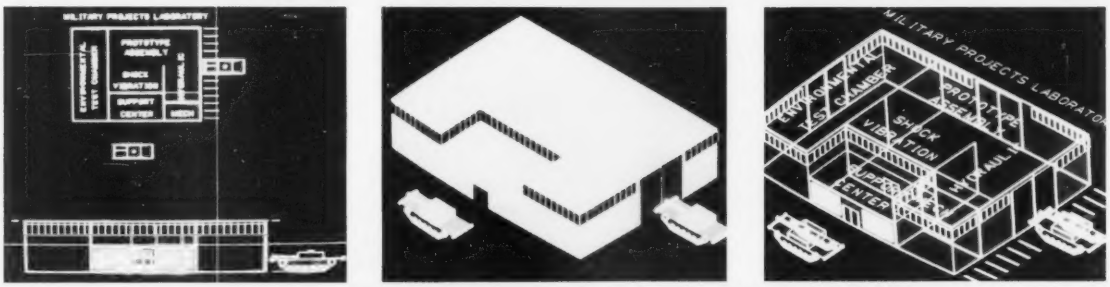
Future applications will include analysis and design software based on NAVFAC criteria, space planning, and utilities network locations and flow analysis.

As systems integration occurs and supporting data bases are built, GEMS will be able also to support utilities management and facilities maintenance functions.

High payoffs are being achieved in such areas as in-house planning which demands frequent updates and changes, and in-house designs which incorporate numerous repetitive elements such as BEQs and magazines.

GEMS capabilities are enhanced by a collection of engineering analysis and design computer programs retained by NAVFAC and NCEL for EFD, PWC, PWD and A&E users. Presently the programs are on commercial timesharing computer service bureau systems such as CYBERNET and Boeing, and on microcomputers. Soon the Computervision systems, microcomputers, and timesharing systems will be interfaced. Engineers will use the programs to receive graphic data from GEMS and return design information to GEMS.

The GEMS symposium at NAVFAC Headquarters was a practical learning experience, an exchange of ideas and suggestions, a comparison of completed and current projects, and a discussion of advanced technology and its application to three-dimensional design not possible with existing methods.



Complete facilities can be visualized in GEMS' three-dimensional models.

Ideas/suggestions exchanged at GEMS symposium

Other significant topics included the development of a long-range management structure and definition of NAVFAC policy and standards.

Participants spent the first part of the symposium presenting and discussing site status reports, including GEMS installations, projects, training, schedules, and problems. Next, they reviewed the NAVFAC standard library and listened to presentations by personnel from the Computer-Aided Engineering Support Office at the Naval Weapons Center, China Lake, Calif.

The following day included work sessions that addressed nongraphical data properties, layering conventions, and standard symbols/details among counterparts from similar disciplines.

Highlights of the status reports are as follows:

ATLANTIC DIVISION

The Atlantic Division (LANTDIV) was the first EFD to install GEMS in February 1983. Since then, LANTDIV has had 12 in-house design projects on GEMS. Design efforts have ranged from a single sheet to a full set of construction plans with 101 drawings. To maintain GEMS skills, operators spend at least eight hours a week preparing standard criteria, symbols, and details when they are not working on production jobs.

In the Planning and Real Estate Division, maps were digitized for nine naval activities. Additionally, contracts were awarded for digital map data bases for Rota, Little Creek, and Naples. The system is used extensively to produce Capital Improvement Plan graphics and other planning support graphics.

WESTERN DIVISION

The Western Division (WESTDIV) completed formal training in September 1984. In-house lectures, laboratory training, audio- and video-tapes were offered. A library of two- and three-dimensional parts including three-dimensional definitive BEQ sleeping design modules was created. A defined three-dimensional building data base model consists of three-dimensional independent design modules.

When the model is complete, the operator generates base drawings that include plans, elevations, and sections for two-dimensional construction drawings. A total of 18 design projects have used, or are using, GEMS. Six more are scheduled for FY85. Users not largely involved with the system are still required to develop their skills by creating standard details and library parts.

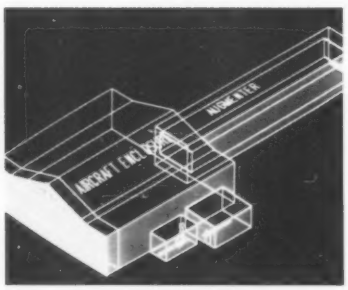
In Planning and Real Estate, maps were digitized in-house for four naval activities. Digital maps were used to support the NAVOBS Flagstaff master plan. Contracts were awarded for digital maps for Mare Island and Sand Point. WESTDIV is also using the system to participate in the port capability study led by the Pacific Division.

NORTHERN DIVISION

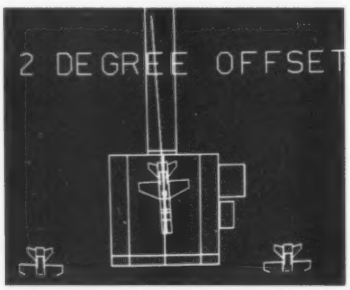
The Northern Division (NORTHDIV) has five design projects on GEMS operational since June 1984. The division is preparing for its first major in-house design project. Each trained user receives eight hours a week of workstation experience, learning standard details and project coordination.

The Division has learned that an open-door policy of workstation access doesn't work. This time should be scheduled because users lose their GEMS' skills if they are not kept current.

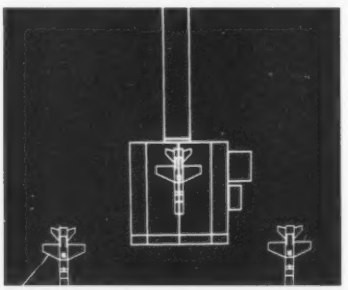
Design Division plans include the design of a proposed medical/dental facility based on medical plates developed according to NAVFAC standards. GEMS work involving



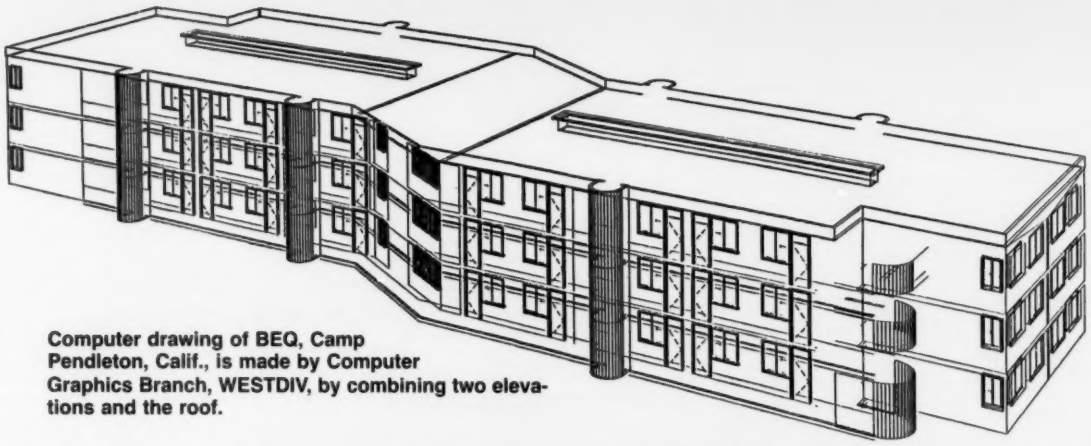
Isometric of typical aircraft acoustical enclosure (Hush House).



Top view of a typical aircraft acoustical enclosure (Hush House) showing aircraft misalignment with augmentor tube.



Top view of a typical aircraft acoustical enclosure (Hush House) with a Navy aircraft aligned with augmentor tube.



Computer drawing of BEQ, Camp Pendleton, Calif., is made by Computer Graphics Branch, WESTDIV, by combining two elevations and the roof.

three-dimensional space and furniture systems layout projects is in progress. A major BEQ project is scheduled for FY85.

NORTHDIV Planning Division has contracted for a detailed three-dimensional general development, real estate summary, and utilities map data base for NADC Warminster, one of the CAEDOS sites.

PACIFIC DIVISION

The Pacific Division has scheduled five graphic design in-house projects for FY85. It completed installation of the system in April 1984. The Design Division has been concentrating upon repetitive designs to develop quickly the needed expertise and to take advantage of the existing data base for faster production turnaround.

The Planning and Real Estate Division entered digital maps for two activities and is producing ship berthing plans for a port capability study, using a library of 580 "stylized" ship outlines that can be entered into the map data base by hull number.

CHESAPEAKE DIVISION

The Chesapeake Division installed the system in March 1984. By late 1984, eight design projects were on GEMS and a ninth was scheduled for early 1985. Three projects designed with the aid of the system were completed. Existing conditions maps and Real Estate Summary Maps for Potomac Annex and the Marine Barracks were digitized in preparation for use in master plans.

Newly trained operators are working on standard details when workstations are available. Two-hour workstation time slots are reserved for operators daily from 7 a.m. to 5 p.m. Workstations are utilized 90% of the time. All plotting is done by batch processing to increase productivity at workstations.

SOUTHERN DIVISION

The Southern Division (SOUTHDIV) completed installation of its system in August 1984. The Planning and Real Estate Division entered general development maps for three naval activities and used the system to produce map graphics for the NSCS Athens master plan and for a Charleston pier study. Additionally, contracts were awarded for digital maps for Charleston and Panama City. SOUTHDIV also will receive a copy of a digital map data base being contracted by Mayport.

A savings of $2.8 million was achieved recently by engineers in the Design Division through the use of GEMS. Because the system allowed more design alternatives to be considered in a short period of time, a decision was made to provide berthing along an existing quaywall instead of building three new piers. The solution not only reduced costs to the Navy but also enhanced ship maneuvering and ease of access to berthing. SOUTHDIV design engineers continue to look for ways to improve designs using GEMS.

PUBLIC WORKS CENTER, SAN DIEGO

The Public Works Center, San Diego, installed its system in May 1984 followed by four months of 100% in-house training. The Center has completed six GEMS projects and has six others on the system. Additions to station building layout libraries and station mapping libraries are underway.

They made it possible . . .

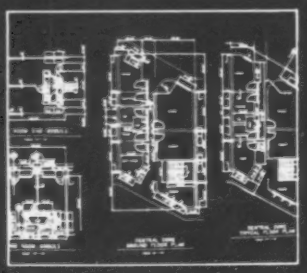
Appreciation is expressed to the following contributors to this article. From NAVFAC — David J. Skar, Director, Engineering Systems Management Division; George Bartsiotas, Senior Program Manager in the division. From NCEL — Robert Odello, Director, Facility Systems Division; Frank Johnson, Project Leader for GEMS at the Laboratory; Jerry Thomas, writer-editor.

$2.8 million in savings

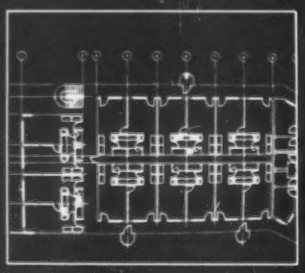
PUBLIC WORKS CENTER, NORFOLK

The Public Works Center, Norfolk, has completed 23 projects. They include floor plans (47 drawings), heating systems, apron extension, lighting, smoke detector systems, and alarm systems. Another 11 projects were on the system at the time of the symposium.

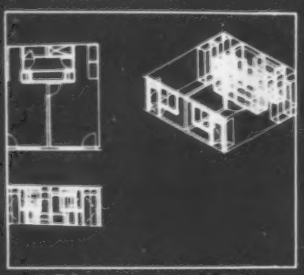
Base sector maps were installed on the GEMS with the intention to use the existing conditions data base on future projects. Specific training in the mechanical discipline is being emphasized. GEMS is used Monday through Friday, 5:30 a.m. to 10:00 p.m.



BEQ room module/core area.

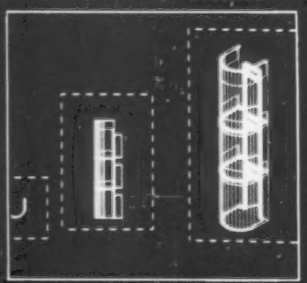


GEMS view — BEQ floor plan.

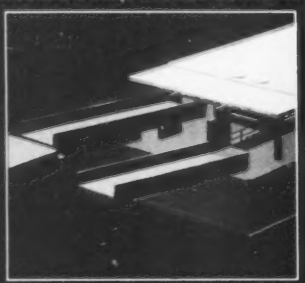


BEQ two-room module.

Conditions map — NAS Bermuda.



Cleaning gear tower — three views.



Floating pier perspective.

PUBLIC WORKS CENTER, PEARL HARBOR

The Public Works Center, Pearl Harbor, installed its system in August 1984 and has completed four in-house projects. Three current projects include office furniture layout, electrical lighting plan, and civil mapping. Scheduled projects include civil, structural, mechanical, electrical, and architectural standard details, mechanical piping layout, and input of existing buildings into the data base.

PUBLIC WORKS CENTERS, OAKLAND AND GREAT LAKES

The Public Works Centers, Oakland and Great Lakes, were completing installation of their systems at the time of the symposium.

NAVAL CIVIL ENGINEERING LABORATORY

The Naval Civil Engineering Laboratory reported results of GEMS software evaluations and capabilities, and presented its recommendations for various improvements based on EFD and PWC requirements.

A GEMS Support Group has been established at NCEL to provide developmental support capability and a central repository of technical capability. Research and development support tasks for FY85 were identified and started. These tasks include software evaluation, software development, and consulting.

A topic of discussion was whether initial building models should be two-dimensional or three-dimensional. (Map models acquired by contract are required to be three-dimensional by NAVFAC specifications.) Two-dimensional models are familiar, well-received and productive. They are simple to comprehend by inexperienced operators because they resemble manual drafting techniques. It is easy to simply rely on manual design decisions and use GEMS only as a drafting tool, but three-dimensional models are the future.

A well-constructed three-dimensional model can lend itself to analysis integration and automatic interference checking. It also can produce two-dimensional construction drawings; little if any manual effort is required for text and dimensioning.

Before three-dimensional modeling is initiated into production, analysis programs must be integrated carefully into the graphics. Formats must be set up properly to extract vector quantities and volume take-offs. Other activities include data base management procedures for incorporating a multi-data base, multi-discipline model, converting public domain software, and linking the data bases to the cost estimating system (CES) and guide specification system (GSS).

Much of this work is appropriately centralized at NCEL through the GEMS Support Group; however, WESTDIV and NORTHDIV are two sites that previously have used three-dimensional modeling in a number of designs.

Workshop of Standard Symbols/Details — Workshops were organized by disciplines (architectural, interior design, electrical, mechanical, civil-structural, planning, real estate management) to critique the NAVFAC standard symbol and detail library.

Also included were discussions on GEMS menu development, layering conventions, and "with lists." The standard library is based on several principles: increased productivity allowing GEMS operators to insert a standard symbol/detail in seconds; avoidance of duplication of efforts; and facilitating the interchange of data bases. The standard GEMS library is part of the Naval Material Command system-wide automation effort.

The symposium served as a definite statement from NAVFAC that it is dedicated to making GEMS function to the maximum benefit of the users. NAVFAC management realizes that technical and managerial problems exist. Participants in the symposium have accepted the problems, and are concentrating on the system's potential: a challenging and changing technology offering countless opportunities and benefits. □

Chlorine leak problem . . . solved!

By PATRICIA E. CLARK
Public Affairs
PWC, Guam, M. I.

Trying to maintain technologically sophisticated systems on the tropical island of Guam can sometimes get frustrating. Nature's unrelenting heat and humidity take a terrible toll and sometimes in unexpected places.

The chlorine cylinders used in treating water both for consumption and for sewage are one example. The cylinders themselves are practically indestructible. The problem is the more delicate valves. A little corrosion in the wrong spot can keep moving parts from doing their job and result in a useless cannister full of useful but dangerous chlorine.

A number of these disabled cylinders had accumulated on Guam, and the Public Works Center was often called upon to stop unexpected leaks and dispose of the contents of the damaged cylinders. In the past, this was done by neutralizing the chlorine gas by passing it through a tank of caustic soda, but this was an unacceptably costly and time-consuming process.

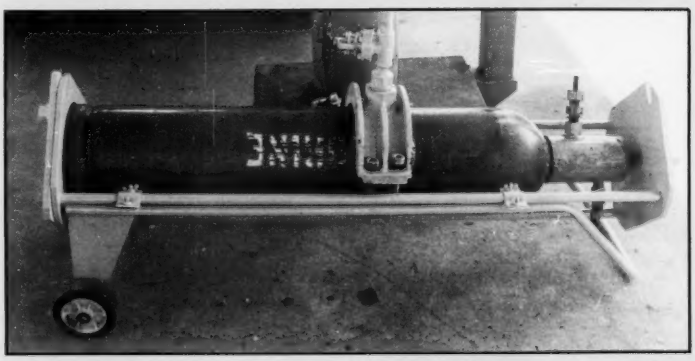
Personnel at the Piti Power Plant, PWC Utility Department's mechanical engineer and the PWC safety engineer have now come up with a procedure that enables them to cope with emergency chlorine leaks on the spot no matter where they occur. The procedure also allows disposal of the dangerous chlorine gas without endangering the environment.

A dolly with a cradle for the cylinders is designed to secure a cap tightly over the leaking valve area at the top end of the cylinder. This efficiently stops the leak as soon as it is fastened in place. The new device replaces the chained-on caps previously used with the standard emergency chlorine kit. Those caps often slid out of place, allowing chlorine to escape into the open air and creating a hazard.

Once the chlorine leak is contained, a special clamp is fitted around the center of the cylinder. The clamp has a valve mounted on it. When the valve is open it permits a drill bit to be inserted through it to make a hole on the side of the cylinder. The moment the drill bit goes through the cylinder wall, it is removed and the valve is closed to hold in the chlorine.

The chlorine cylinder, with the valve mounted on it, is then transported in a dolly that holds the entire assembly tightly in place. The cylinder's valve is later connected to the chlorinating machine at the Public Works Center sewage treatment plant, where the chlorine is released at a controlled rate to treat sewage water.

This new procedure has recently been used to safely reclaim chlorine in over thirty cylinders.



Damaged chlorine cyclinder lies on its side. The valve cover at right contains the leak and is held in place by a wheeled cradle. A clamp around the cylinder's center securely holds a replacement valve.

39 graduate basic at CECOS

Thirty-nine officers joined the ranks of the U.S. Navy's Civil Engineer Corps in December 1984 when they graduated from the Naval School, Civil Engineer Corps Officers, Port Hueneme, Calif. All have accepted assignments all over the world — from Long Beach, Calif., to Virginia Beach, Va.; from Pearl Harbor to Spain; and from Alaska to Puerto Rico to name a few.

The class, No. 173, completed eight weeks of specialized training pertinent to the school's needs for shore installation engineering, public works management, and Seabee operations.

Six students graduated with honors: Ensign Keith R. Leonard, Jr., was the outstanding graduate, and graduating with distinction were Lt. William M. Peacock, Lt(jg). Mark M. Brunette, Ens. Carlos D. Clarke, Ens. Michael E. Ladd, and CWO2 John H. Bond.

Ens. Keith R. Leonard, Jr.'s photograph is indicated by ( ). Those graduating with distinction are indicated by ( ), and those entering Seabee duty by ( ).

★Ens. Keith R. Leonard, Jr.
BSE/UCLA
to Rota, Spain

Ens. James R. Adler
BSEE/N. Arizona Univ.
to Pearl Harbor, Hawaii

Ens. Joseph J. Albanese
BSCE/Univ. of Lowell
to Sigonella, Italy

Continued on page 9

the year-end

DUMP:

cause, effect and positive management

By CURRAN D. SMITH
Navfac Executive Development Cadre Member

Historically, millions of Operations and Maintenance, Navy (O&M,N) dollars that cannot be obligated as planned are shifted from mission accounts, such as; flying hours and force modernization, to Maintenance of Real Property (MRP) programs where they can be obligated prior to the end of the fiscal year. The rippling down effect caused by the migration of funds, especially in the third and fourth quarter of a fiscal year, is commonly referred to as "year end dump."

Each year, Navy Public Works Centers (PWCs) and their customer activities spend countless hours trying to manage the year end dump and its consequences. What are the reasons for this yearly phenomenon and how can customer activities that are serviced by PWCs effectively manage the year end dump?

This act provides interim funding to continue operating but at a level less than budgeted for normal operations. Supplemental appropriations for civilian pay raises, which occur at the beginning of each fiscal year, and unforseen military operations, such as Granada and Lebanon, are not enacted until late in the third or beginning of the fourth quarter.

Severe spending restrictions result in reduced program execution, and contingency reserves are siphoned off at each apportioned level. Within the O&M,N appropriation, the most discretionary dollars are in MRP. Maintenance and repair of real property is controllable.

Short-term funding can be deferred to meet the relatively fixed and constant requirements of other O&M,N programs such as personnel salaries and utility services. Consequently, funds provided for real property maintenance at the beginning of the fiscal year are borrowed when unfunded or under funded operational requirements must be supported. These funds are repaid at the end of the year when the annual appropriation and subsequent supplementals are approved.

This inconsistent level of program funding adversely affects the execution of the maintenance and repair of real property program by customer activities serviced by PWCs.

Increased claimant/subclaimant funds in the form of year-end dump money creates extreme pressure on the activity to meet the congressional intent (maintenance floor) of obligating funds to satisfy maintenance deficiencies in the fiscal year in which they were appropriated.

As a result, over half of the funds allocated to correct valid maintenance deficiencies are obligated in

the fourth quarter of the fiscal year. In the activity's haste to satisfy both claimant/subclaimant requirements and congressional edicts, projects of questionable need are funded while higher priority inspection generated facility deficiencies and mission essential projects are forced into the unreconciled but growing backlog.

Indicative of this dilemma is the alarming rise in the backlog of maintenance and repair (BMAR) deficiencies even though Congress continues to appropriate a significant amount of real dollars in an attempt to reverse this trend.

One major flaw in managing the year-end dump is the lack of an effective maintenance execution plan. In most cases, maintenance and repair projects are not priortized based upon mission needs and documented deficiencies.

Funding considerations are primarily based on the availability of project estimates, project cost and command interest. In the current budget environment, field activities can expect the year-end dump phenomenon to continue for many years into the future.

Activities should begin to consider the year-end dump as another O&M,N funded program and be prepared to manage with an effective maintenance execution plan. An effective maintenance execution plan centers around a list of maintenance and repair projects supported by valid facility deficiencies. These projects should be prioritized based upon mission needs with a current cost estimate which accurately identifies the work requirements.

Another integral part of executing the maintenance plan is the interaction between the PWC and the customer activity. PWCs should encourage customer activities to build up a backlog of fundable estimates which are greater than the amount of the expected or projected year-end dump.

When the year-end dump funds are received, PWCs should assist customer activities in packaging their maintenance requirements in order to meet NAVCOMPT criteria for obligating funds on project orders.

A new Public Works Center Management System (PWCMS) Production module is being developed by NAVFAC to further assist customer activities in managing the year-end surge in maintenance and repair dollars. When implemented, the Facilities Support Planning module will provide PWC serviced customer activities with a comprehensive maintenance execution plan.

"The year-end dump cannot be reasonably attributed to one single cause or reason. Rather, it is a combination of factors."

Included within this production module are: all unfunded and current year funded facility deficiencies; all current maintenance and repair work in process, all funded special projects; and all future maintenance and repair projects.

Since the year-end dump is likely to occur for many years and will continue to have a significant impact on both the customer activities and the Public Works Centers, a spirit of cooperation must exist.

Customer activities and PWCs must work together utilizing both existing and new management tools and methods to effectively manage the yearly influx of maintenance and repair dollars. □

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to CB 2

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to Corpus Christi, Texas

Lt. Damian A. Colden
BSCE/Va. Military Inst.
to Virginia Beach, Va.

Continued on page 10

Continued from page 9

Ens. William F. Dettman
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to Patuxent River, Maryland

Ens. Jeffrey D. Draper
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to Vallejo, Calif.

Ens. David P. Faulk
BSIE/Univ. of Pittsburg
to Yuma, Ariz.

†Ens. Patrick J. Gibbons
BSCE/GA Inst. of Tech.
to NMCB 4

Ens. Gail M. Haberlin
BSNA/Naval Academy
to Portsmouth, New Hamp.

Lt. Robert P. Harris
BS ARCH/The Cooper Union
to Subic Bay

Ens. James F. Harry
BSE/Georgia Tech
to Adak, Alaska

Ens. Donald L. Helken
BSGE/Naval Academy
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Ens. John J. Heinzel
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Ens. Erik D. Hjerpe
BSOE/Mass. Inst. of Tech.
to South Weymouth, Mass.

Ens. Robert P. Hymel
BSCE/Miss. St. Univ.
to Mid Pac

•Ens. Michael E. Ladd
BS occe/Wayland Baptist U.
to Keflavik, Iceland

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What is an OSOT? Read on!

By
CDR DONALD M. HAYDON, JR.

The Naval Communication Station Stockton, Stockton, Calif., has trained and equipped an On-Scene Operation Team (OSOT) whose mission is to respond to and contain hazardous material spills on this 1400-acre Navy base.

Why is a communication station concerned about hazardous waste? In addition to being a key link in Navy and DOD communication systems, NAVCOMMSTA Stockton is also the host to a variety of DOD and other federal agencies, including the General Services Administration. Rough and Ready Island, the location of the communication station, has nearly 5½ million square feet of warehouse space and boasts the longest inland wharf in the country.

The supply distribution operations of GSA and other agencies, and the excess property handled by the Defense Property Disposal Office present a continuing threat of a hazardous material spill.

Because of the spill potential and the fact that Rough and Ready Island is surrounded by waterways of the San Joaquin River delta, the base must be able to respond immediately to contain and clean up even minor spills.

In late 1983, the Fire Department was designated as the On-Scene Operation Team, or OSOT. Under the direction of the Safety and Occupational Health Officer, the Fire Department was tasked to train the firemen who would comprise the OSOT and to obtain and outfit a response vehicle for use by the OSOT.

Because of the obvious hazards inherent in handling hazardous materials and hazardous wastes, training of the OSOT members was the first priority. In 1984 the entire fire department attended a 40-hour course provided by a private contractor using NAVOSH funds.

The course content included physical and chemical properties of materials, classification and definition of hazardous materials, and practical instruction in methods of containment, clean-up and decontamination.

Several months before presenting the course the contractor visited the station to survey the types of materials handled and identify the possible spill situations, so that the training could be oriented toward actual situations that the firemen would face.

After evaluating several types of vehicles, a van-type trailer was selected to serve as the emergency response vehicle. The trailer measures approximately 8′ x 8′ x 16′ and is pulled to the scene of the spill by a one-ton pickup truck assigned to the fire department.

The trailer is divided into two main compartments, one a small library and the other the equipment and clothing storage area.

The library section contains a complete DOD hazardous material information system, the DOT emergency response guide books, chemical handbooks, Coast Guard CHRIS manual and many more. It even includes a microfiche reader.

The equipment storage area contains everything needed to contain any spill and to clean up small spills. The most important items are the personnel protective gear.

Ready for quick access are different types of protective clothing appropriate for specific exposures and self-contained breathing apparatus. The equipment in the trailer includes overpack drums, absorbent material, sampling and testing instruments and tools.

NAVCOMMSTA Stockton has been a pioneer in developing a rapid on-base hazardous material spill response capability. For more information concerning the OSOT, contact the Fire Chief at AUTOVON 466-7202 or the Public Works Officer at AUTOVON 466-7271.

The On-Scene Operation Team makes a regular inspection of the equipment in the emergency response vehicle.

How to be an effective staff civil engineer without a maintenance force

By LCDR W.E. OLSON

The position of Staff Civil Engineer (SCE) has been the subject of many discussions, because of a lack of understanding as to what are the responsibilities of the position. This is evidenced by the number of SCEs that have their own maintenance force. For the SCE to effectively carry out his/her duties, he/she can not afford the time to manage a maintenance force.

How the System Effects the SCE

The primary reason why SCEs are having problems is a lack of training specifically for SCEs. What makes a Public Works Officer effective is not the same as what makes a SCE effective. They have many things in common, but their points of view are different. The only way to learn what it takes to become an effective SCE is to live the problems; unfortunately this results in the activities being adversely effected because of the long learning curves.

This problem is aggravated when an ensign is assigned as an SCE, which can have negative effects on both the activity and the PWC. To alleviate this problem, an officer should be required to go through training prior to becoming an SCE; the obvious place for the training is CECOS.

To be eligible to instruct this class the officer should have been an effective SCE at a major command without a maintenance force.

Another problem is the effectiveness of the senior ace. If the incumbent of this position does not understand the problems of SCEs it will be difficult to properly support the SCE. Once again to acquire this knowledge the individual will have to have experienced the problems of an SCE.

Also it is important that the senior ace position be recognized as the source of power within PWC, so that the SCE has a source of influence within the PWC to ensure the interest of the activity is properly supported.

The senior ace is a critical position to the effectiveness of the SCE, because for an SCE to be effective he/she will create problems associated with how well the PWC is performing. As with any command, PWCs do not like to be told they are not supporting their mission as well as they should be, especially when they are being told by a junior officer.

The senior ace should have prior experience as an SCE for a major command. Also the senior ace should be assigned additional duty to all commands supported by an SCE, to ensure he/she has some accountability to the activity for the "performance" of PWC.

The SCE problems are compounded by his/her commanding officer not fully understanding the role of the SCE. Usually the SCE is held accountable for the performance of the PWC, and can do very little to effect its performance unless the senior ace is effective.

This could be resolved by having the senior ace ADDU (additional duty) to the activity, and be accountable for PWC's performance. This would go

Continued from page 10

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Lt. Donald E. Taylor
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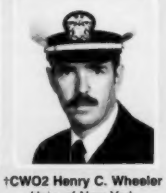
to Bremerton, Wash.

CWO3 David L. Thompson
to UCT 1

Ens. Frank W. Titus
BSCE/Univ. of Delaware
to Keflavik, Iceland



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a long way to relieve the SCE from resolving political problems, which is an ability that the average junior officer has not adequately developed.

How the SCE can be More Effective

The above problems deal with how the system has hampered the SCE in the performance of his/her duties. As important, is the management that the SCE uses to accomplish his/her duties. To address this issue, first a clear definition is needed as to what the duties are of an SCE. The SCE's primary duty is to effectively program the use of his/her activity's maintenance/operation funds. The funds can be broken down into three categories:

- Operational — Utilities and transportation
- Preventive Maintenance — Dynamic Equipment Inspection and Serving (DEIS), standing jobs, maintenance agreements, service contracts, and transporttion
- Corrective Maintenance

Operational funds need to be monitored to ensure only the essential services are being funded, especially with respect to energy. Preventive and corrective maintenance are the areas where a majority of the problems arise and where the least is done to effectively resolve the problems.

Often the SCE will get so involved with emergencies that there is no time to do effective maintenance planning. This process of "oiling the squeaky wheel" is detrimental to maintaining the operational readiness of an activity.

Effective maintenance planning is essential when dealing with a PWC, because there is very little if any control on the programming of work accomplishment. The following is a proven means of effectively programming work into a PWC.

The process starts with the Annual Inspection Survey (AIS). The SCE needs to be confident that the AIS adequately documents the deficiencies.

If the SCE is not satisfied with the AIS, he/she needs to work with PWC to improve the identification of deficiencies. When programming, the important things are the deficiencies and their general magnitude.

The next step is to realistically define and prioritize the nondeferrable deficiencies. An aide to prioritizing the specific work is the Emergency/Service (E/S) work. There should be a system established so that the emergency work can influence the definition and programming of nondeferrable deficiencies.

The next step is to determine the amount of funds available for specific work, including projections as far into the future as available from the comptroller. Next, determine from PWC what kind of work they prefer to do during the seasons. The basic concept from this point is to program work into PWC a year in advance, by quarter, taking into consideration the season that it is prefered to do the work. This programming needs to be done on a quarter by quarter basis.

> "The only way to learn what it takes to become an effective SCE is to live the problems."

Next, there needs to be an understanding between the PWC and the SCE on the use of funds assured. PWC needs to agree not to go any further than the completion of the final plan until funds are received, and the SCE needs to make a reasonable commitment to fund the work.

Both sides need to understand that there will be times when the SCE states funds assured and not be able to fund the work. Usually the work will be able to be funded in the next fiscal year.

It should be noted that the SCE has already stated in the AIS that the work is nondeferrable. The programming from this point is just a refinement on a quarterly basis of work into PWC.

The above programming technique works very well because it allows the PWC to better manage their workload, by being able to program the design, to better define their supply needs, to be more aware of long lead-time materials, and to better program the work accomplishment, i.e., so that they do not have paving in the backlog ready to go during the winter months etc.

The end results are that work is better planned, resulting in the more efficient use of funds, and the work will be completed sooner.

An added benefit of this kind of programming is it should greatly reduce the need for priority A and 1 work, which should provide for better response on these urgent requirements.

During the refinement process each quarter, any urgent or command issues should be programmed into PWC with the appropriate priority. Then reprogram work requests already in the system as necessary.

It is important that all activities being served by a PWC use this type of programming to ensure the maximum benefit.

Another problem that SCEs are faced with is the year-end dump. With the above programming this problem is basically nonexistent, because work for the year should have already been programmed into the PWC.

The SCE can then reprogram additional work during the first quarter's programming when there is sufficient time to properly program the work. Also PWC will be better able to assimilate the work into their system because it is already in the system.

With an effective maintenance planning program in place, the next step is to ensure that there is sufficient preventative maintenance to keep the facilities from degrading.

For dynamic equipment, there has been a new program initiated, e.g., maintenance agreements. The maintenance agreement can only be effective if the PWC is held accountable for their work or the lack of. To hold PWC accountable, they will have to be financially responsible for repair of the equipment, if it is determined that the reason for breakdown is the lack of proper preventive maintenance.

If the above steps are implemented the PWC performance will be greatly enhanced in the view point of the line community, because the condition of facilities will be improved along with the performance of the PWCs. □

AT LAST, THE ANSWER TO A BURNING QUESTION, WHAT IS A CED?

By LCDR EDWIN WEYRAUCH

When I was first assigned to be the CED Officer at CBC Gulfport I didn't know what a CED was exactly, or what the specific function was. Since that time I have learned there are a number of Civil Engineer Corps Officers who share the same dilemma.

CED means Construction Equipment Department and there are three of them, one at each Construction Battalion Center (CBC). Their primary responsibility is to provide support to the active Naval Construction Force (NCF) and the Pre-Positioned War Reserve Material Stock (PWRMS).

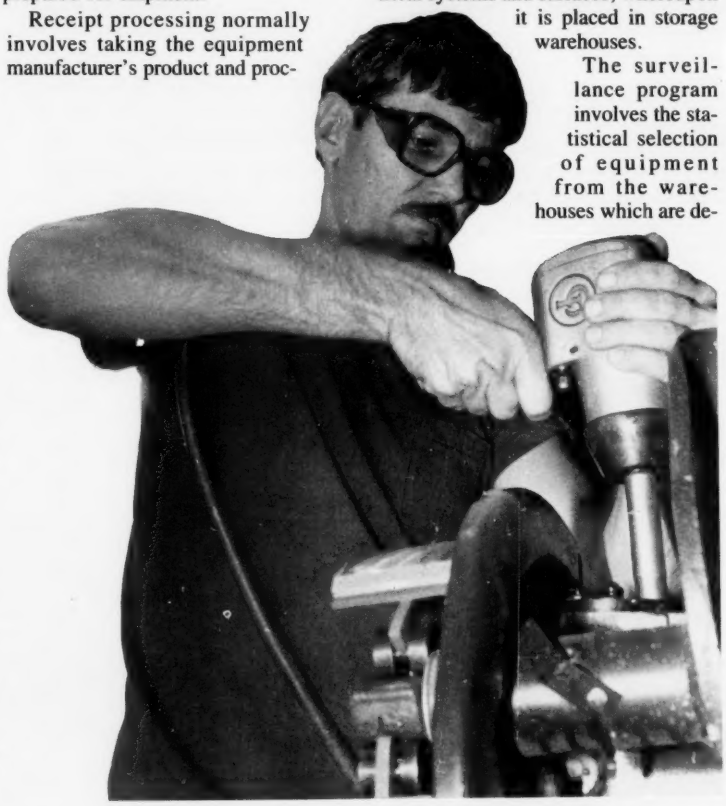
This support involves the maintenance, repair, and process of new receipts for warehouse storage, surveillance of stored equipment, overhaul and shipment processing of a vast array of construction, and support and transportation of equipment. While each of the CEDs are the same in this fashion, they are individual and unique in the support provided to tenant commands and other units.

At Gulfport, the other support areas involve the repair, maintenance and overhaul of the Naval Construction Training Center's equipment, the CBC's equipment and a number of smaller activities which operate mostly transportation equipment.

Although the NCF and PWRMS equipment stocks are kept separate and distinct, the support required by each program is very nearly identical. In each program equipment is received, preserved for storage, inspected and prepared for shipment.

Receipt processing normally involves taking the equipment manufacturer's product and processing it by removal of any rust, repainting, applying special preservatives to all mechanical and electrical systems and surfaces, whereupon it is placed in storage warehouses.

The surveillance program involves the statistical selection of equipment from the warehouses which are de-



Mechanic services the brake system on a new five-ton dump truck before storage.

A CED heavy mobile equipment mechanic removes a power converter from a Cat D-7 bulldozer.

A preservation servicer refinishes a Cat 637 twin engine scraper.

Continued from page 13

preserved, tested, checked, cleaned, repaired and painted as necessary and then re-preserved, in the same fashion as new receipts, for further storage.

Based upon the condition of these drawn samples, an evaluation of preservation techniques/materials and of the ready for issue state of the stored material is developed, which in turn determines future preservation practices and sampling techniques.

Shipping involves the same process as surveillance except that rather than returning the equipment to the warehouse, it is prepared for transport to the allowance of a using activity such as a Naval Mobile Construction Battalion.

Physically the CED at Gulfport occupies two buildings and is organized into four shops, two heavy and construction equipment shops, one light, support and transportation vehicle shop, a support shop which includes sandblast, paint, body repair, metalworking and welding functions, and an administrative section.

On average, the department is comprised of 87 personnel who provide the skills and talents required to support more than 2000 pieces of equipment ranging in complexity from grass cutting equipment to large earthmovers, medical trailers or asphalt batch plants.

Within this general term "support" is included minor maintenance, full or partial overhaul, lubrication, tire changes, testing, assembly and total or partial refinishing.

To get an idea of the difficulty and complexity of this support one first has to consider the several hundred pieces of this equipment which have various sizes and types of tires and batteries, the special oils, lubricants and fluids involved, the thousands of different repair parts and the unique technical characteristics of an assortment of equipment, all of which must be checked, maintained and repaired by a limited staff with tools and knowledge versatile enough to meet any challenge.

While the workload and output of the repair shops is easily recognized, what is often forgotten is the staff of schedulers, inspectors, estimators, clerks, supply, support and supervisory personnel who take the resources (manpower, money and time) and manage the combination of these with the wants, needs and requirements into the proper result.

In sum, the CED is to construction, support and transportation equipment what the repair shipyard is to naval vessels. □

Equipment staging yard at CED.

an editorial

departments

The American Flag: Now and Forever

By T.C. MURPHY
Professor Emeritus, CECCS

There were 10,000 combatants per square mile on Iwo Jima in February 1945. The V Amphibious Corps — composed of the 3rd, 4th, and 5th Marine Divisions and a Seabee unit — were deployed on the island surface; the defenders were underground — in tunnels, trenches and caves, in bunkers, pillboxes and gun emplacements — fortifications it had taken two years to build.

The defenders were dug out, chased out, bombed out, forced to fight on the surface. Only 216 (of 20,000) survived to become prisoners of war. Marine losses were very heavy.

On D + 5, the 3rd Platoon, Easy Co., 2nd Battalion of the 28th Marines fought its way to the summit of Mt. Suribachi where they raised out flag; too small. A flag large enough to be seen by all Marines on the 7.5-square-mile island was wanted. A second flag, 4 ft. by 8 ft., was obtained from LST 779.

This flag raising on Feb. 24, 1945, was photographed by an Associated Press Photographer, Joe Rosenthal. It is one of the great pictures of our time, a tribute to the men and women who fought in WWII and especially to those who took the island on the doorstep of Japan; they hastened the end of war. They looked up to that flag on Suribachi.

It took the men of V Amphibious Corps six weeks to secure the island. Battalions of the "Right Stuff" went ashore at Iwo. In that short time, in that little space, 27 Medals of Honor were won. Twenty-seven. "Uncommon valor was a common virtue" was the way Admiral Nimitz described it.

Then, there was another flag. This one was worn, publicly, as a diaper, by an adult American male while he paraded in solitary blasphemy in Los Angeles: the ultimate pornographer. It was the day after Thanksgiving 1983.

The sight of "Old Glory" being so contemptuously misused would sicken most Americans; many would be outraged to see the flag which symbolizes that which is noblest and best about our nation, our people, our culture and heritage so savaged. It was — and is — a crime against the people of the United States.

The man was arrested, brought before a U.S. magistrate and charged with desecration of the flag. The "diaper" was taken from him to be used as evidence. It had been soiled.

The foregoing episodes draw into sharp contrast two very different kinds of men. On the one hand, honorable, courageous men of character — the best, the brightest and worthiest. The nation will be indebted to them for all time.

On the other hand, another kind of man; a man without honor, of low character and dubious worth. To that kind we owe nothing — except punishment and contempt.

It is important that we and our descendants keep that distinction firmly in mind; now and forever.

situation report

departments

The $431 million cost-plus-award-fee contract with the joint venture of Raymond, Brown and Root, Mowlem (RBRM) for construction on Diego Garcia continues to make excellent progress.

The FY 81/82 program is essentially complete, including a deep draft wharf, small craft berthing, parallel taxiway, parking apron, bachelor housing, utility systems, and a host of other operational and personnel support facilities.

The FY 83, 84 and 85 programs are well underway and will be complete by the summer of 1986. Included are the upgrade of the existing runway, approximately 20 MILCON facilities and numerous O&MN projects.

Construction Battalion Units (CBUs) consist of a junior CEC officer and 35-60 Seabees and are assigned to several activities throughout the United States.

The mission of the CBUs is to provide a contingency construction augment capability to the Naval Construction Force (NCF), to provide individual military and technical skill training, and to undertake various construction projects in support of the activity commanding officer.

Five new CBUs located at Newport, R.I.; Long Beach, Calif.; Washington, D.C.; Mayport, Fla.; and Mare Island, Calif., will be commissioned in Fiscal Year 1985 and 1986, joining the other 17 already serving the Navy.

CEC Officers School celebrates 40t

By STAFF

The year 1945 was an eventful year — one the world will probably never forget. World War II, the war to end all wars, ended with the surrender of the German High Command on May 7th and the surrender of the Japanese on September 2nd following the detonation of the first two atomic bombs; and millions of GIs returned home to become civilians again.

Three British scientists, Sir Alexander Fleming, Howard W. Florey and Ernst Boris Chain, shared the Nobel Prize in 1945 for discovering penicillin; the American League's Detroit Tigers won the World Series by edging out the National League's Chicago Cubs four games to three; the musical play "Carousel" opened on Broadway that year and another play "Harvey" captured the Pulitizer Prize; and in the field of pugilism, Rocky Graziano was named "Boxer of the Year."

And in Davisville, Rhode Island, the Navy opened its doors on what was to become one of its most prestigious schools — the Civil Engineer Corps Officers School, later referred to simply as CECOS. Today, the name has changed slightly to Naval School, Civil Engineer Corps Officers, but the acronym remains the same . . . CECOS. On May 1, 1985, CECOS observed its fortieth birthday.

The history of CECOS began early in 1942 when an officer's indoctrination and training course was instituted at Camp Allen, Norfolk, Virginia, to meet World War II's rising demand for trained officers. This first and meager training program was the forerunner of today's highly respected Civil Engineer Corps Officers' School.

Captain Robert E. Bassler, first commanding officer of CECOS.

THE BULLDOZER

THIS WEEK CEC Officers School Starts New Training As Staff Increases

Fly Home, Head of Line Club Among 10 Prizes Offered Bond Purchasers

Your Smoker Photo Story Is on Page Four

SEABEES COVERALL

CEC SCHOOL ESTABLISHED

U.S. Drops Bon Jobs Machines

Returns From 'Hawaii'

At Camp Endicott, the *Bulldozer,* issue of June 8, 1945, announced the new school. One year later, on Oct. 3, 1946, the *Seabee Coverall* at Port Hueneme told of the school's move there.

In February 1943, all Civil Engineer Corps — Officer and Seabee training was moved to Camp Peary, Williamsburg, Virginia, and a specialized training course for Navy Public Works Officers was also established in Norfolk, in May of that year.

Much of the officer training during the hectic early war period was virtually extemporaneous. Captain Bernard O. Roessler, reminiscing about the era, told how he became a "professor of public works" overnight. Then-Commander Harry Bolles of the Navy's Bureau of Yards and Docks called Captain Carl W. Porter, Officer in Charge of the 5th Naval District, in May 1943 and stated that the Civil Engineer Corps Officers' School had just been authorized at the Naval Operating Base, Norfolk.

Roessler, then a lieutenant, was ordered by Captain Porter to found a Public Works training course for the next morning as 20 officers were on their way from Camp Peary. Roessler became a one-man faculty and hurriedly assembled a training program for the young officers: a course of study, quarters, messing facilities, study lessons — in short, everything required for a two-week course. From this hurried program was established CECOS' very successful Public Works training curriculum.

The expanding war demanded more and more officers, particularly CEC officers, to head the Seabee battalions. Consequently, in May 1944, the training school was moved to Camp Endicott in Davisville, Rhode Island, to be consolidated with the PWO course, which had just been transferred from Norfolk to Davisville. For the first time, Civil Engineer Corps Officer Training was put in a single school, under one roof. This marked the real founding of CECOS.

The headline which appeared in Camp Endicott's official newspaper, *The Bulldozer,* issue of June 8, 1945, stated, "CEC Officers' School Starts New Training As Staff Increases." Then, reflecting the shortage of CEC officers, went on to state "Senior CEC officers visiting this vicinity will be invited to visit and lecture to the various classes. . . ."

Later, *The Coverall,* at the Construction Battalion Hueneme, Calif., issue 1946, had this to say abo official establishment at Endicott.

Members of the first pilot course in disaster relief pay attentior held at BuDocks, Washington, D.C. in August 1950 and prese CECOS staff.

"The School, which a under the Bureau of Docks, was officially

CEC

*Capt. Robert E. Ba
Capt. Alexander S
Cdr. Boyd S. Broo
Cdr. James S. Ma
LCdr. Harry C. Wil
Cdr. Ernest L. Eus
Cdr. Francis T. Pri
Cdr. Tom W. Beck
Capt. Ralph C. Je
Capt. Mark H. Jor
Capt. Louis N. Sa
Capt. John F. Bea
Capt. Eugene L. F
Capt. Charles M.
Capt. Olin L. Dixo
Capt. Leroy D. La
Capt. James T. Ta
Cdr. David N. Hull
Capt. Frederick G
Capt. James B. C
Cdr. Alec T. Pringl
Capt. John L. Det

*Served as OICC, C
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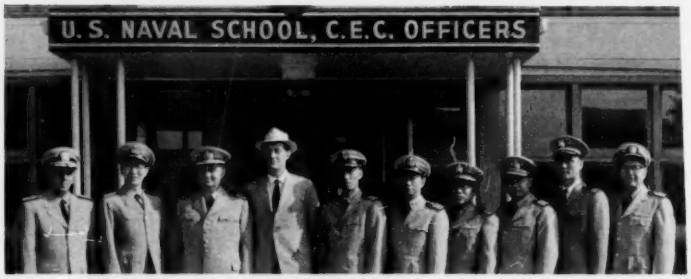
ially established on

1 May 1945 under the Bureau of Naval Personnel, with a staff complement of 105 officers and 207 enlisted personnel. This staff was principally occupied with the work of training, and much of the logistic support of the School was derived from the Naval Construction Training Center.

"Courses in the School included Construction Battalion Training, Public Works Training, Midshipman Training, Stevedore Training, Refresher Training, Utilities Training, and Transportation Training. During peak operation, over 900 officer students were enrolled in the various courses. Graduates of the Public Works Course alone number 1300. It is estimated that approximately 85 percent of the wartime strength of the Civil Engineer Corps (over 8500 officers) attended one or more of the various courses in the School."

In September 1946, the entire school was moved to Port Hueneme. Under the management control of the Bureau of Personnel, it became a component of the Military command of the Commanding Officer of the Construction Battalion Center, Port Hueneme.



Foreign naval officers attending CECOS in 1959.

By December of 1946, the school's staff — four officers, four civilian instructors, three civilian clerks, a librarian, and illustrator, had been formed. Class I started June 2, 1947, as a ten-and-a-half-week course and graduated 15 students. Class II started in January 4, 1948; and the curriculum expanded to 16 weeks.

Since this time, the school has steadily updated and improved its curriculum. All CEC officers attended the school at some time in their careers, usually at the outset of their career in the Corps.

CECOS has been the primary source of training for CEC officers for the past 40 years.

Today, CECOS provides new officers with basic orientation and training for their first tours of duty. These officers are newly graduated engineers and architects who are joining the Navy from engineering schools around the country through OCS, NROTC programs, Naval Academy graduates, direct appointments, or by transfer from the various line communities in the Navy.

The eight-week basic CEC Officer Course is not offered elsewhere in the Navy. Its objective is to orient new CEC officers toward their role in the Navy and to prepare them for their first billet assignment in Public Works Management, or Construction Battalion Operations. The other courses offered include such facilities related subjects as energy management, environmental protection, shore facilities planning, economic analysis, service contracts, air installation compatible use zones, and Seabee construction management.

Throughout the career of a CEC officer, he or she will continue to attend more specialized courses related to future assignments. At the 7-year and 13-year points of their careers, CEC officers return to CECOS for professional refresher courses.

CECOS Library c. 1960.

A variety of courses are offered including the Basic CEC Officers' Qualification Course; a two-week Advanced CEC Officer Course for mid-range Lieutenants; a two-week Naval Facilities Systems Management Course for CEC Lieutenant Commanders; two six-week management courses for Senior Chief Petty Officers; and more than 20 specialty/technical courses varying in length from one to four weeks.

Another facet of the school's function is to train officers of allied nations. The school began training officers of other nations under the Military Assistance Program on August 23, 1959, when it accepted a handful of officers from the Republic of China, Korea, Turkey, Japan, and Great Britain. The program was begun to help other nations develop their naval training programs and to work more closely with the U.S. Navy. The course taught the men modern techniques of shore establishment maintenance.

During the past few years, foreign officer students under the Mutual Defense Assistance Plan (MDAP), from Chinese, Korean, Philippine, Iranian and Thailand navies, have

Continued on page 18

CECOS Commanding Officers

E. Bassler	Sep	1946 to Oct	1946
der S. C. Wadsworth	Oct	1946 to Jun	1949
Brooks	Jun	1949 to Sep	1949
. Marsh	Sep	1949 to Apr	1951
. Wills	Apr	1951 to Sep	1952
. Eustis	Sep	1952 to May	1954
T. Pritchard	May	1954 to Feb	1956
Beck	Feb	1956 to Oct	1956
C. Jensen	Oct	1956 to Mar	1960
. Jordan	Mar	1960 to Apr	1963
I. Saunders, Jr.	May	1963 to Jul	1966
Beaver	Jul	1966 to Jan	1970
e L. Pickett	Jan	1970 to Oct	1971
s'M. Howe	Oct	1971 to Jun	1974
Dixon, III	Jun	1974 to Aug	1975
D. Lawson	Aug	1975 to Jul	1978
T. Taylor	Jul	1978 to May	1979
Hull	May	1979 to Jul	1979
ck G. Kelley	Jul	1979 to Aug	1981
B. Caughman, Jr.	Aug	1981 to Mar	1983
Pringle	Mar	1983 to Jul	1983
. Dettbarn	Jul	1983 to	present

CC, Camp Endicott and Newport from May 1945 to Sep-

An unidentified line officer presents a diploma to Lt. Hyung J. Kang of the Navy of Republic of Korea at the CECOS graduation ceremony, April 1954.

CECOS' 40th year

Continued from page 17

undergone instruction and graduated from CECOS. They were enrolled in both the basic CEC and the select CEC courses.

In addition to CEC officers and students from foreign military organizations, CECOS also enrolls other Navy and Armed Forces personnel, civilians of the Department of Defense and other government agencies, as well as naval reserve personnel on active duty for training. Over 3,000 students attended CECOS last year in over 90 separate course offerings. Nearly half of these courses are presented as "road shows" outside the Port Hueneme area and closer to the Navy's major bases in the United States and overseas.

The School is under the technical direction of the Chief of Civil Engineers and is a component of the Naval Technical Training Command. CECOS administers the Moreell Library, which provides an outstanding selection of professional and technical material in direct support of the School. It also houses the papers and writings of Admiral Ben Moreell, founder of the Seabees.

After forty years of successful operation and thousands of students later, CECOS is going stronger than ever. The facilities, which have changed gradually over the years, are due for an even greater change in the near future. An applied instruction building is planned for fiscal year 1988 to replace "three inadequate WWII facilities." Construction is expected to be completed in December 1989.

Many will remember building number 43 at Port Hueneme, however, for that's the Naval School, Civil Engineer Corps Officers, perhaps better known simply as CECOS, an institution close to the hearts of Navy personnel all over the world. An institution not soon to be forgotten. □

reader's comments/questions

departments

Our sincere apology to distraught author

I think your readers will have a little easier time reading my article "Fully War Ready — Today's Seabee Equipment Goal" in the Winter 84-85 issue if we get the paragraphs in the same order I wrote them.

For the two or three people who might want to dope out what I really was saying, the published location of paragraphs 8-16 should be switched with paragraphs 31-43.

Finally, I continue to look forward to receiving your magazine each quarter and appreciate the opportunity to be published in it.

Also, please note that my name is spelled with an "E."

LCdr. M.E. Oakes, CEC, USN

You're correct LCdr. Oakes, the paragraphs ***were*** *in the wrong order. And for that we offer our sincere apology to you. To explain* ***why*** *they got mixed up would take several pages of this issue. To simplify, however, we discovered a flaw in the system and plugged it immediately to avoid a similar occurrence. It will probably never happen again. As for your name, we promise to write it 100 times as punishment. Here are the first five times:* ***OAKES, OAKES, OAKES, OAKES,*** *and* ***OAKES.***

Thank you for your article and please give us another chance at keeping the continuity in order.

Capt. Miller comments on Barrett's editorial

The editorial by LCdr Gerard Barrett appearing in the Fall 1984 issue struck a very responsive chord. Although I believe LCdr Barrett is absolutely correct, I doubt that the majority of the Civil Engineer corps will either appreciate his comments or agree with his conclusions.

In my opinion, Public Works duty is not only the most challenging duty available to a CEC Officer, it is the most important to the Navy (not necessarily to the Corps however); and there we run into a paradox. What percent of the former Chiefs have spent a preponderance of their careers in Public Works?

What percent of the Officers who achieve the rank of Captain spent a preponderance of their careers in

Continued on next page

departments

Continued from last page

Public Works? What percent of the retired Lieutenant Commanders spent a preponderance of their careers in Public Works? The answers might reveal a pattern; it may be that Public Works duty is hazardous to continued promotability.

And if that is true, how sad it would be. If, in the judgement of our Line Officer superiors (the CO's of most Shore Activities having a PWO), we demonstrate outstanding performance, do CEC Selection Boards take that opinion as equal to the opinion of a CEC officer who may have signed the FITREP of our peer? Is the identical FITREP signed by another CEC officer (who better can judge the performance of another Engineer/Architect) even more believable? I wish I knew.

LCdr Barrett is commended for his editoral, you are commended for publishing it; would that the entire CEC adopt its' premise.

Capt. Robert K. Miller
CEC, USN (ret)

Thank you for taking the time to send in your comments. They were appreciated.

Gerald (I mean) Gerard happy with editorial

I was very happy to see my Editorial Comment, "Public Works Career Perspective" in the Fall 1984 issue . . . My comments seemed very appropriate when read in conjunction with Rear Admiral Haynes', "Speaking from Topside." comments.

I hope that you are able to put my other remaining editorial in the next issue as a follow-up on the Public Works problems outlined in the Fall issue. If by chance, you do publish my remaining editorial, please be sure my first name prints as "Gerard" vice "Gerald." If you were "Gerard" and had been called "Gerald" in error most of your life, you'd understand the problem.

LCdr. Gerard Jude Barrett
CEC, USN

Dale Carnegie said, "A person's name is the sweetest sound in any language," or something close to that, and we try very hard to make our mistakes on other words instead. We missed in your case Gerard. Please excuse us and thank you for your letter.

CEC — more than "pure" engineering

Received the Fall 1984 edition of the *Navy Civil Engineer* magazine with the NATO Article. Thank you very much for the copies, and your outstanding editing of the article for publication. It keyed in on the central theme — the CEC is much more than "pure" engineering, and one can have fun in all parts of the world doing all sorts of engineering-related things and still have the ultimate satisfaction of a civil engineer (I have noted some editorials-letters to the editor — that took exception to that philosophy in recent editions).

I only regret that credits couldn't have been given to the contributors to the article from other NATO commands; but, most have departed the NATO scene in the past year, so I understand the reasons. It was a group effort, however, although I drafted and submitted the work . . .

I hope the previous two articles (Saudi Arabia and the NATO Belgium) have also assisted in the recruiting effort for the CEC. The chance to be CEC and to travel all over the world is rewarding, for those who take the opportunity. To "Join the Navy and See the World" is not foreign to the Civil Engineer Corps — I know first hand with four accompanied overseas tours, and six TDY tours with the Seabees.

Keep up the great efforts with the *Navy Civil Engineer.*

Cdr. Bruce B. Geibel
CEC, USN

Thank you for your article, your letter and your kind thoughts. May I pass along to you the many compliments I have received for your article. It's not too late, Bruce, to credit those people we missed. Contributing to your article were Capt. Charles P. Andersen, Cdr. Richard A. Laurance, Cdr. Ronnie A. Hoyt, and Cdr. Robert J. Degon — all CEC, USN. Gentlemen. Thank you!

It was our pleasure, Ann

Thank you for your thoughtfulness in sending me extra copies of the Fall 1984 *Navy Civil Engineer.* It really warms my heart to see my name in print. I enjoyed being able to contribute to the magazine. I very strongly believe the *Navy Civil Engineer* is an important vehicle for spreading the word about the important work the CEC and NAVFACENGCOM is doing.

If is is not inconvenient, could you please mail me three more copies? My father would appreciate it.

Thank you, again, I hope I may contribute another article, again, in the future.

Ann M. Stephenson

Thank you for writing, Ann, and thank you once again for your article. I trust you received extra copies as requested? If not, please call.

"We build. We fight" said before Seabees?

Having the collateral duty of Lay Leader, one morning at quarters a few years ago, I opened my brief inspirational with a multiple choice question — "Who was the first Seabee?" (a) Admiral Moreell, (b) John Paul Jones, (c) Nehemiah, (d) John Wayne (when in doubt, a good sailor goes to C). With tongue-in-cheek, the answer is (c) Nehemiah. From about 425 B.C., in Nehemiah 4:17,18 we read: "They which builded on the wall, and they that bare burdens, with those that laded, every one with one of his hands wrought in the work, and with the other hand held a weapon. For the builders, every one had his sword girded by his side and so builded."

Doesn't that sound like "We Build — We Fight"?

EOC David Devries
RNMCB 17
DET. 0517, Port Hueneme

Thank you for sharing your thoughts with our readers.

news worth reviewing

departments

Navy's salvage compensators now modified

The Naval Civil Engineering Laboratory (NCEL) Port Hueneme, Calif., is completing the modification of the final two ship motion compensators developed for the Navy's Supervisor of Salvage for use in heavy lift and recovery operations in deep water.

Relying on 10 years of development and operating experience, NCEL has redesigned the original system and increased its lift capacity to 55,000 pounds. Earlier versions were limited to 22,000 pounds.

The ship motion compensator incorporates a ram tensioner which removes excessive snap loads on the lift line, compensating for the vertical motion of the work vessel caused by ocean swells.

Basically a tensioner is an air spring with sheaves attached to both ends. When a tensioner and deck winch are used during lift operations, the action of the air spring cancels most of the vessel's vertical movement at the lift point, keeping the lift line tension at an almost constant level.

When the ship heaves up, the line tension increases slightly causing the ram tensioner to retract and pay out sufficient line to cancel the vessel's heave motion. When the vessel moves downward into the trough of a wave, the line tension decreases slightly allowing the air spring to expand and take up excess line.

Dr. Francis Liu, NCEL senior research hydraulic engineer and project leader, said that after tests are conducted this spring in the Caribbean Sea, the Laboratory will instruct the Navy's Mobile Diving and Salvage Unit on the operation and maintenance of the modified ship motion compensators.

NCEL expertise with ocean lifting systems and deep sea recovery opertions proved instrumental in the recovery last winter of a Marine Corps helicopter and 10-ton truck from a water depth of 1,700 feet off San Clemente Island, Calif.

The ship motion compensator . . .

First FY85 training session at WESTDIV

Naval Reserve Engineering Field Division West held its first FY85 planning and Facilities Support Officer training session recently at the Western Division Naval Facilities Command headquarters, San Bruno, Calif. Among the key speakers were Commodore D.O. Smart, Commander Reserve Division Naval Facilities Engineering Command and Captain Benjamin F. Montoya, Commanding Officer.

The training outlines NAVFAC's role with its Civil Engineer Corps selected reserve counterparts and detailed functions of the facility support officer. The program was conducted using individual presentations and workshops.

Is it a boxcar? Building? No, it's a fire truck!

What's manufactured in Oshkosh, Wisc., and weighs 75,180 pounds empty? It's the Navy's new crash/rescue vehicle, purchased by NAVFAC to join the fleet of fire trucks at Norfolk's Sewells Point area naval complex.

The new truck is being used to extinguish fires in wide-bodied aircraft should a crash or emergency landing occur at Naval Air Station Norfolk's Chambers Field. By discharging a maximum of 2,400 gallons of water or a six percent water and foam solution per minute, the truck will save lives and prevent further property damage to jumbo military transport planes.

Should a crash or emergency landing occur, the fire truck would roll up alongside the craft and its two watergun turrets — one in front and one in back — would be trained on the fire until the major blaze was under control. Should a small blaze continue, the handline nozzle would be used to extinguish the fire in the traditional method.

The Navy's newest fire truck is about the size of a boxcar.

The two waterguns in the roof turrets can each discharge from 600-1,200 gallons of water or a water and foam solution per minute. A handline nozzle can handle 100 gallons per minute. The turret waterguns can shoot fluids up to 300 feet from the truck either in a stream or a dispersed pattern.

With a body almost 50 feet long and ten feet wide, the truck is approximately the size of a railroad boxcar.

"I'm over six feet tall, and when I stand next to the wheels, I have to look *up* into the wheel well," marveled the naval station's fire chief, Al Cuthriell.

The truck requires three operators, one to drive and two to operate the two watergun turrets, front and back, and can be anywhere on the airfield within two minutes.

Point Molate sea wall to be rebuilt

The Navy Works Center (PWC), San Francisco Bay, is rebuilding about 2,800

feet of sea wall at Point Molate, near Richmond, Calif.

Severe storms, compounded by high tides and ocean wave action impacted the area. Weather and tidal action caused accelerated erosion of the shoreline and threatened collapse of a fuel pipeline and railroad track built along the edge of the shoreline.

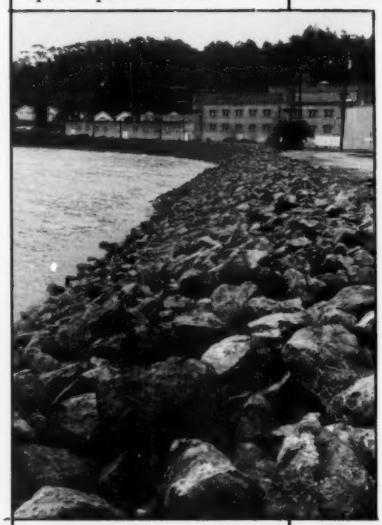
The obvious solution appears to be — repair the sea wall and correct the problem, however, it is not that simple. Because of the archeological significance, Point Molate is a protected area. Before construction work can be undertaken, special permission is required from state and local societies and organizations.

Artifacts representative of the early American Indian culture have been unearthed, a historic Chinese fisher village and other prehistoric sites are believed to exist at Point Molate. Archival research places the Chinese fisher village in the area where the Richmond Park is presently located which is near the general area where a portion of the sea wall will be constructed.

After the San Francisco earthquake and fire of 1906, the California Wine Association purchased 47 acres of land on the East Bay site near Richmond, and invested $3 million in construction of a main storage plant and winery. The operational area became known as "Winehaven" and employed about 500 people.

Today, the Point Molate Fuel Depot is managed and operated by the Naval Supply Center, Oakland. The PWC San Francisco Bay has started work on the sea wall and construction is currently underway.

Fill dirt is being transported from a nearby Point Molate excavation site, and the shoreline is being restored to the original configuration.



A 1200-foot section of the Point Molate sea wall nears completion. Some of the Winehaven buildings are visable in the background.

National Awards

Productivity

The Navy Public Works Center, San Diego, has been selected as the winner of the Chief of Naval Material's 1984 Productivity Excellence Award.

The CNM award is presented annually to eight activities that have demonstrated creative problem solving techniques and have found better methods for performing industrial-type tasks. The competition is open to all installations under the command of the Chief of Naval Material.

Admiral Steven A. White, CNM, commended the Center, stating that "you have upheld the highest tradition of performance."

A/E of the Year

Two men working on Guam have taken top honors in the 1984 Pacific Division NAVFAC (PACDIV) A & E of the Year Award, reports PAO Jeanne A. Light.

Donald E. Nielsen, who served as director of the Officer in Charge of Construction, NAVFAC Contracts, Marianas (OICC Marianas) engineering and construction division at the time he was nominated, received the award in the 36-years-or-over age group.

Lt. Gary A. Engle, head of the maintenance engineering department at the U.S. Navy Public Works Center, Guam (PWC Guam), won the award in the under-36-years-of-age group.

Marvin Shields Medal

Construction Mechanic First Class Daniel J. Brunger, USN, is The Society of American Military Engineers' 1984 recipient of the Marvin G. Shields Medal. Petty Officer Brunger was recognized for his exceptional performance as the 31st Naval Construction Regiment Equipment Maintenance Shop supervisor and for his work as NMCB-Four's Alfa Company heavy equipment shop supervisor. NMCB-Four is homeported at Port Hueneme, Calif.

SAME Moreell Medal

Captain W. J. (Joe) O'Donnell, CEC, USN, is the recipient of The Society of American Military Engineers' Moreell Medal for 1984. The award recognizes outstanding contributions to military engineering made by a member of the U.S. Navy Civil Engineer Corps or a civilian employee of NAVFAC.

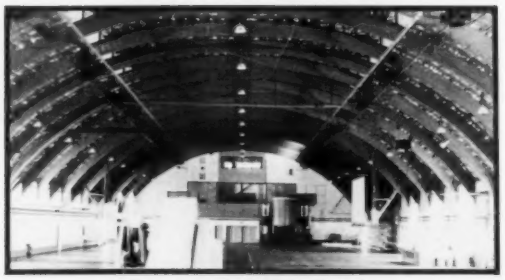
Currently serving as the OICC, Naval Medical Command, Southwest Region, San Diego, Capt. O'Donnell is responsible for the construction of a $293 million hospital complex. The project includes a 950,000 square foot hospital building, outpatient clinic, the Naval School of Health Sciences, associated support facilities, light care facilities and parking structures.

Peltier Award

For the third year in a row, NMCB-133, Gulfport, Miss., has captured The Society of American Military Engineers' annual Peltier Award. The award, which recognizes the outstanding active naval construction force unit, is proof positive that the "Kangroos" continue to demonstrate the motivation and ambition that has ranked them among the top of the U.S. Navy's "Can Do" Seabees.

Old base shoe with failed arch.

Family Activity Center



Interior ceremonial drill hall.

Putting life into 42-year-old arches

By LT KENNETH H. RIMMEY, CEC, USN
E. I. T.
Assistant Production Officer
PWC, Great Lakes, Ill.
and
RUTH BETH
Public Affairs Specialist

Six laminated-wood arch buildings at the Naval Training Center, Great Lakes, Ill., are being spared from the wrecker's ball due to the efforts of an expert team assembled from Great Lakes, Philadelphia, Pa., Port Hueneme, Calif. and NAVFAC Headquarters. After an intensive study, these early 1940s structures are getting a new, 20-year lease on life; and one more is under review in hopes of salvation.

Built in 1942 as training facilities to ready sailors for war, four of the buildings continue to serve as drill halls, one provides recreational facilities including hobby shops and indoor playing courts, one serves for indoor storage of motor vehicles and equipment, one has been converted to a Family Activity Center, and two — a gymnasium and a pool — have been permanently closed, pending demolition. Current replacement costs for the buildings exceed $3 million.

Averaging 115 feet wide by 500 feet long (enclosing 57,500 square feet), each building is supported by 30 laminated-wood arch members. Laminate strips, ¾ inch by 7½ inches, are united with casein glue, forming 7½ inch by 28-inch member that extends from a concrete footing to a center hinge 42 feet above the ground. The building shell is constructed such that the lower 15-foot ends of these classic three pinned arches protrude out of the structure.

PROBLEMS IGNORED

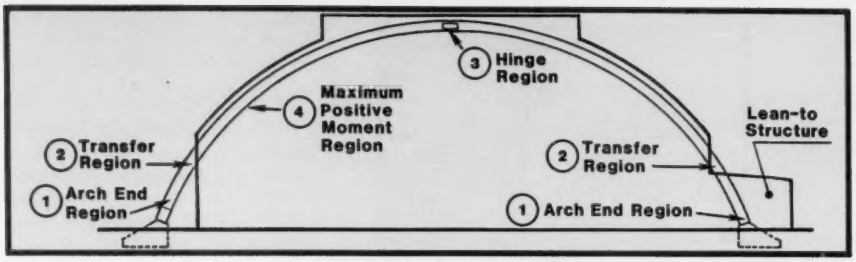
Just one year after construction, the Navy became concerned about the appearance of some arches. An initial investigation attributed the cause to poor wood seasoning during the lamination process. As member delaminations continued to appear, a second survey in 1944 reported the first sign of decay with soft spot findings in some of the arches.

More than a decade later, additional wood decay prompted a third survey. This 1957 report attributed the decay formation to the outer 15 feet of the arches being exposed to the elements and recommended that the metal coverings at the arch ends be packed with penta grease and caulked with thiokol or heavy asphalt between the covering and the base shoe.

Although many intermittent repairs were made during the years, the survey recommendations were never fully implemented. Decayed wood was removed, only to have good wood decay with time, due to exposure to the weather. Also, the water soluble casein glue, used in the initial lamination process, made arch delamination inevitable over time.

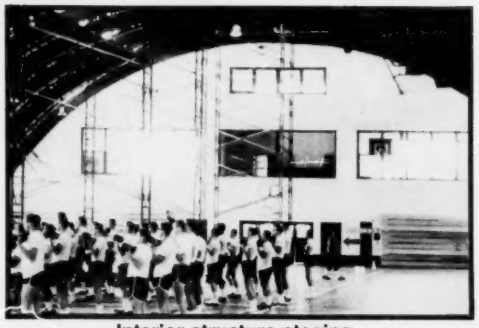
CORRECTIVE MEASURES ACCEPTED

Finally in 1982, after 40 years, visible evidence of structural failure convinced all concerned that serious cor-



Typical section through building.

Arch end shoring (north view).



Interior structure staging.

rective measures were required. Now, concerned with the potential immediate loss of these still-required buildings, the Navy obtained the services of government wood experts — the United States Department of Agriculture's (USDA) Forest Products Lab to investigate the arch problem.

Noting again the cause of extensive wood decay as being exposure to weather elements, the USDA recommended immediate attention be given to the arches by contracting the services of an experienced consulting engineering firm.

The architectural and engineering firm was under contract to PWC Great Lakes by the end of 1982 to study seven arched buildings. The A&E inspected four primary sections of the arches: the arch ends; the "transfer" point (just outside of the point where the arch enters the building); the center hinge, and the maximum positive moment region (the arch midsection).

The initial findings — showing a serious problem with some deteriorated arches and structural integrity to be much less than designed — prompted additional visual review, wood probing, curing, and sounding.

Based on the June 1983 recommendation of the A&E — that the structural deterioration was so extensive in some buildings that they should be closed immediately as a life-safety precaution unless additional bracing was provided — PWC forces installed temporary, heavy timber shoring at selected arch ends identified by the A&E firm as the most critical problem areas.

Because of added risks of a high-use building and the number of arches rating poorly, PWC, in conjunction with the A&E, made the unpopular recommendation that the gymnasium in Building 500 — serving over 500 sailors a day — be closed until arch repairs could be made.

Closing the building was made more acceptable after NTC Great Lakes received funding approval from the Chief of Naval Technical Training to relocate some gym activities to two other buildings. Later, NTC Great Lakes decided not to repair Building 500 since a replacement facility was programmed for construction in FY86.

July through August was a busy time of preparation: the A&E and other wood consultants were further investigating arches; NAVFAC Headquarters and NORTHDIV sent inspection teams to gain first-hand knowledge of the condition of the buildings; NAVFAC's Chief Engineer, Dr. Yachnis, called upon the Naval Civil Engineering Lab in Port Hueneme to assist in evaluating the structural capacity of the deteriorated arches.

This multi-party work achieved the NAVFAC communities' purpose: A united voice, by both private sector and government personnel, conveying to the building "owner," NTC Great Lakes, the seriousness of the arch problem, warranting the immediate vacating of several of the buildings, and verifying that funding for special project repairs was required.

The NTC community accepted the need to vacate the wood arch buildings, but asked the NAVFAC community to pursue an interior repair method to permit some of the structures to be re-opened.

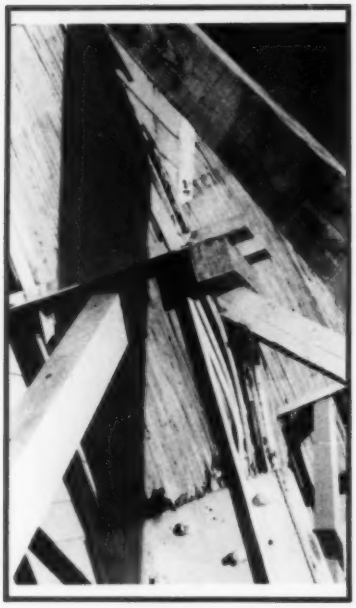
NAVFAC developed a structural staging plan to allow five arch buildings to be re-opened. Interior staging, placed at the center hinge, allowed the buildings to be occupied for the next year as long as wind, snow, and ice conditions stayed within agreed-upon limits.

With NTC Great Lakes adjacent to the "Windy City" of Chicago and in the snow belt of the upper midwest, these conditions became very real operational constraints.

With A&E design work completed, the Resident Officer in Charge of Construction Office at Great Lakes began managing the repair work in Novem-

Continued on page 24

End shoring (west view)



Arch end shoring

Arches

Continued from page 23

ber 1983. The A&E's construction cost estimate, for steel repairs to the arched buildings, was $2.5 million.

PWC selected the plate steel repair method over a concrete option presented by the A&E, because it provided three advantages: the absence of a need for concrete curing reduced overall construction time; additional costs associated with placing and curing concrete during the lengthy sub-freezing winter season were avoided; and the construction technique of steel collars and side plates was considered more manageable than that of concrete buttresses replacing exterior arch members.

Due to the uniqueness of the overall job and specialized nature of some aspects of the work (i.e., relaminating the wood arches through high-pressure epoxy injection) the contract was awarded through the competitive negotiation process.

The construction award was made

UPDATE: *Work in progress —*

By LT MARK MIGLIORE, CEC, USN
ROICC, PWC
Great Lakes, Ill.

Five laminated-wood arch buildings at the Great Lakes Naval Training Center were given a new lease on life recently. The buildings, four of which are Recruit Training Command drill halls, and the base Youth Activity Center, were originally constructed in 1942 and composed of ¾ inch (1.9 cm) by 7½ inch (19.1 cm) wood strips laminated together to form 7½ inch (19.9 cm) by 28 inch (71.1 cm) members extending from an exterior concrete footing to a center hinge that is 42 feet (12.8 m) above the building floor.

The 150 plus arches in these buildings were found to be in varying degrees of both serious wood decay and delamination causing serious concern for continued safe occupancy.

A firm was selected to conduct an extensive, detailed analysis of each building, recommend the most efficient method of repair for each arch, and design the repairs for execution by civilian contract.

The method chosen, as recommended by the A/E firm, was to first remove sufficient dead load from the arches in each building by interior or exterior shoring, as appropriate, to inject low viscosity epoxy under pressure in the delaminations interior to the structure, and to inject fumigant and preservative in the exterior portions of each arch.

Additionally, a group of 48 4-inch (10.2 cm) diameter steel shear connectors were to be embedded, 24 on each side of each arch at the region of maximum stress and ½ inch (1.3 cm) steel plates were to be bolted to the sides of each arch through the shear connectors, enabling a load transfer from the wood to the new steel.

The plan also called for the installation of 1 inch (2.5 cm) diameter stitch bolts vertically through the arch, the installation of ⅞ inch (2.2 cm) diameter bolts horizontally at the center hinge, the tightening of all cross bracing extending between each arch, and finally release of the dead load back onto the structure by removal of the temporary shoring.

The use of steel plates was chosen by the government over an alternative concrete repair option to save lengthy concrete cure time, eliminate expensive concrete placing costs which would be required above ground, and employ construction techniques to provide steel over the wood which would be easier than that of using concrete buttresses to replace exterior arch members.

A $3 million repair contract for the five buildings was awarded under the administration of the Officer in Charge of Construction at Great Lakes. Initial progress on the complex project was slow as expected, due to its numerous unique aspects.

The arches in the drill halls had undergone much twisting and warping over their lifetime which had not been visible during the design process. As a conse-

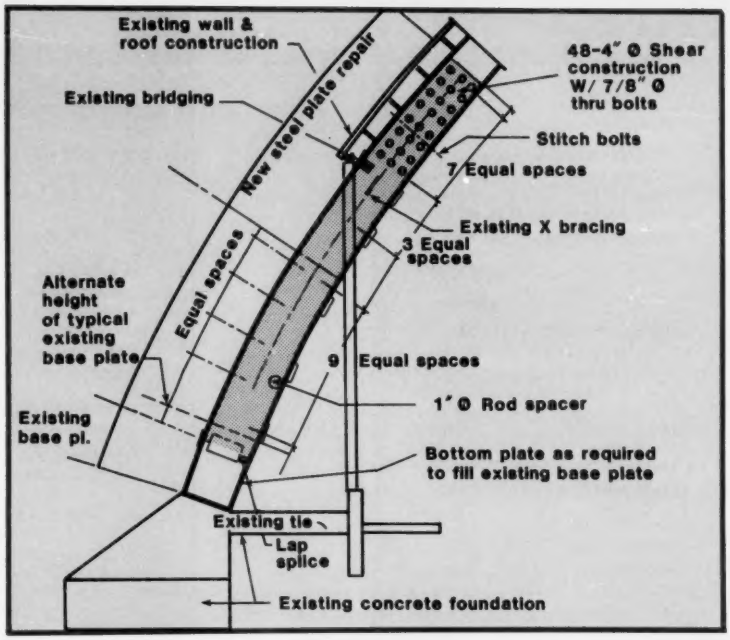
early in 1984 for $2,866,918 and work is in progress. Inspection is being performed by both the OICC staff and the A&E firm under a Title II construction inspection service contract.

To gain additional information on the structural action of the arches, the Naval Civil Engineering Lab conducted an arch load test on one of the more severely damaged buildings scheduled for demolition.

The test setup consisted of three six-ton load cells acting as three point loads on the arch. Gauges were placed to record six displacement readings, eight wood strain readings and two arch rotation readings.

The results of this test will permit comparison of the current arch strength to the original arch design strength.

Facts gathered during the year-long inspection of Great Lakes' arched buildings, as well as the arch load test, will develop a data base for future work at Great Lakes and for possible similar occurrences with the Navy's 42 other wood arched buildings of the same vintage. □



Steel plate repair

Five arches given 20 additional years

quence, there were difficulties in embedding the shear connectors, and in the erection and measurement of steel plates due to unexpected misalignment of the bolt holes.

Also, the criticality of the completion dates for each building, coupled with the long initial learning curve, necessitated much overtime and weekend work by the contractor to maintain the tight construction schedule.

The unforseen presence of steel nails and spikes inside the arches contributed to slow progress by hampering the drilling operations required for shoring erection, shear connector embeddment, steel plate erection, and epoxy injection. Hazards inherent in the work caused numerous minor slowdowns. Since the majority of welding required to erect the steel plates was in such close proximity to the wood, small fires were created which required immediate attention.

Finally, difficulties in the subjective government weld inspection process slowed down progress and necessitated occasional rework and retesting prior to acceptance. Alternatively, a more accurate system would be obtained by using an ultrasonic inspection technique in addition to the magnetic particle process which was specified.

The best alternative, if funds are available, would be to let a separate E/S contract for weld testing and inspection to assure 100 percent reliability of these important welds.

Despite these obstacles, constant coordination between the government, the customer and the contractor assisted in keeping the project on target. As the contractor's knowledge of, and experience with, the laminated wood arches improved, the project's momentum significantly increased.

The contractor completed and turned back over to the government, one building each in August and September, two buildings in October and one in December — all either on or ahead of schedule.

Another similar wood-arch building, the Public Works Center equipment storage facility, will be repaired under a separate contract to begin early in 1985.

Despite various setbacks encountered during the repair of these buildings, vital recruit training activities were able to continue uninterrupted. They will now continue for the additional 20 years added to these critical shore facilities by the unique repairs.

Due to the scarcity of funds available for the construction of new drill halls, and the need for training to continue, the project's cost was justified for the base at Great Lakes, and would be recommended for the repair of similar buildings at other Navy installations should new construction funds be unavailable. □

index 1984

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Navy hospital is first in secondary containment

By LCDR GEORGE H. TITUS, CEC, USN
P.E., Calif.
and
ENS CAROLYN J. BOWLING, CEC, USN
E.I.T.

The new secondary containment standards for hazardous substance underground storage tanks were recently put into action at the $293 million Naval Hospital Complex currently under construction at OICC Naval Medical Command Southwest Region, San Diego, California. In an effort to protect against ground water releases, California Ordinance No. 6753, which went into effect on May 10, 1984, placed mandatory restrictions on design, construction and installation requirements for underground tanks intended to store hazardous substances.

The design for the Naval Hospital called for three 48,000 gallon underground fuel storage tanks. Since the project was designed and the contract awarded prior to the effective date of the ordinance, the existing contract had to be modified in order to fulfill all requirements for the necessary permit.

The guidelines directed that the primary containment tanks should be constructed of a corrosion resistant material; an impermeable, corrosion reisistant system would be designed to intercept and direct leaks away from the primary tank to a monitoring well; and the well must be constantly monitored by an automatic instrument or daily by a manually read gauge.

To meet these requirements, a contract modification was issued to provide secondary containment using liners around the three fiberglass tanks already purchased for the project. The modification for the Main Hospital Complex consists of three basic zones: single-walled fiberglass tanks; individual, shallow pan liners surrounding each tank; and a monolithic outer liner enclosing the entire installation.

The law also requires secondary containment for the fuel lines to and from the tank. This was accomplished by lining the pipe trench. All liners are composed of a polyester elastomer which is impermeable to the substance stored within the tanks (in this case diesel fuel).

During installation of the monolithic outer liner (131′ by 113′), the base of the liner is sloped to provide drainage to a central location at one end of the liner. (top photo — next page). Anchorage for the tanks is provided by an 18″ thick concrete slab (71′ x 51′) which extends over the entire base of the liner.

Individual tank liners including monitoring wells were provided for each tank to provide a means of deterimining which tank was responsible if leakage should occur. The next photograph shows one tank in place and the individual liners being prepared for the two remaining tanks. The two vertical pipes shown are recovery wells that extend to the bottom of the outer liner.

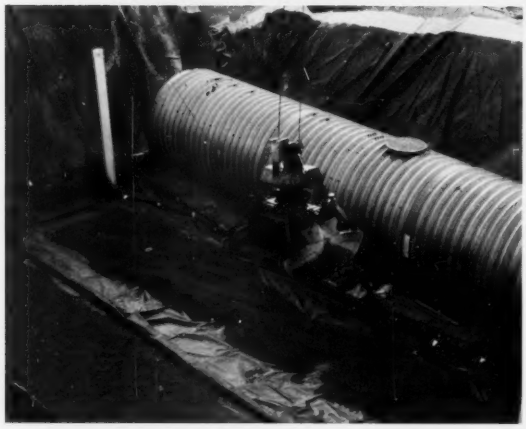
Once the tanks and monitoring tubes were in place the entire area was backfilled with pea gravel (approximately 2000 cy) as shown in the last photograph. The required pipe trench is also lined with a liner of the same material and is field welded to the outer layer to form a leakproof envelope around the entire system.

Once the tanks are in use, monitoring will be accomplished either electronically or manually through the monitoring wells. If leakage is detected, pumps may be lowered through the recovery wells to pump out free liquid from either the individual liners or the outer liners.

The entire installation procedure was continuously monitored by Navy Construction Representatives and personnel from the Division of Environmental Health Protection, County of San Diego. In addition, time lapse photography and 35mm slides were taken to provide project documentation.

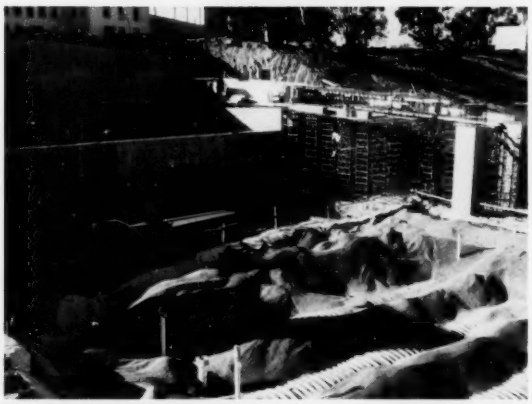
The system under construction at the Navy Hospital Complex is currently the largest secondary containment liner system installed in the United States and is being monitored closely by environmentalists to determine its effectiveness in preventing ground water contamination. □

Installation of monolithic liner



With one tank in place, the individual liners are being prepared for the remaining two tanks.

The Navy hospital complex is currently the largest secondary containment system installed in the United States.



Once all tanks are in place, the entire area is backfilled with pea gravel.

Paver Implementation

(. . . some potholes to avoid).

By THOMAS D. BRUDER

P. E., Ariz. and S. C.
NAVFAC, Charleston

Pavements do not last forever. The repair of maintenance of a pavement is inevitable. Consider that the majority of the Navy's pavements were constructed during the 1940s and 1950s. The life of an average pavement is roughly 20-30 years (depending on construction procedures). To replace these older pavements today, we could expect to pay from 385 to 550% more for the pavements constructed in the 1950s and from 570 to 1131% more for the pavements constructed in the 1940s.

Putting these facts together, it is no wonder that the Navy is spending millions of dollars each year on maintaining and rehabilitating pavements and still more work needs to be done. Quite simply, pavements are deteriorating faster than they can be repaired. With budget constraints looming, engineers must find ways to get the best fix for their money.

Fortunately, with the advent of computers, large amounts of information can be processed quickly, accurately and inexpensively. A tool now exists which can aid managers to effectively manage their pavements and hence maximize maintenance and repair dollars. It is called PAVER.

The PAVER Pavement Maintenance Management System was developed by the U.S. Army Construction Engineering Research Laboratory (USA-CERL). It is a computerized system permitting the input, output, storage and analysis of pertinent pavement information.

This system is a tool which can help pavement managers make sound decisions. However, we must not be hasty and "jump aboard the band wagon."

Advanced planning, a commitment from upper management and diligence are necessary to successfully implement a PAVER system. Unfortunately, regardless of the amount of planning that has occurred and how cautiously the system is implemented, problems do occur.

The severity of the problems, more specifically their impact on the implementation, is what is important. The problems encountered during the implementation of the PAVER Pavement Maintenance Management System at the Naval Station, Charleston, are presented not only to help reduce wasted time and money on future implementations, but to help "get our money's worth."

These are not all the problems which could be encountered during an implementation, but a few of the noteworthy ones encountered during the Naval Station, Charleston, contract.

Southern Division, Naval Facilities Engineering Command was tasked through an engineering service request to provide the Naval Station, Charleston, which consists of ten miles (16 kilometers) of streets and roads and 408,630 square yards (341,615 square meters) of parking, with a management system which would maximize their pavement repair dollars.

It was decided that the PAVER Pavement Maintenance Management system would be used and that the implementation would be accomplished by consultant. The implementation was programmed to take six months. A contract was negotiated and the A/E began work in June 1984.

The lessons learned from this implementation have been divided into the areas of administrative and technical. Both are equally important and can substantially impact implementations.

TECHNICAL POTHOLES

The Section Identification Record is one of the most important PAVER components, and as such, should be as accurate as possible. The section ID record should indicate all physical features of the section as well as the location of all sample units within the section. All features noted should be dimensioned. Each section and sample unit should be tied to some known point. The section area should not be merely the length times width, but should include all pavement area. All deceleration and acceleration lanes, and pavement areas off curb returns should be included.

Intersections should be kept intact and included in the higher ranking pavement section.

When large amounts of data are to be transferred into a computer by people, errors will always be present. The larger the amount of information, the more errors. It is extremely important that the branch and section identification records be input first, checked for errors and approved.

Do not input additional information until this has been done. The hierarchy of the data base is such that errors in these two forms can cause some of PAVER's subroutines not to run. Depending on the number of branches, sections and error type, making corrections can be laborious.

Obtain the most up-to-date users manual and microcomputer software and USE them. As the use of PAVER continues to increase, errors are found and corrected while system modifications and new ideas are presented. Having the latest users manual and microcomputer software can prevent many frustrating hours of error correcting.

Be consistent when putting data into the data base. Users are afforded limited latitude when inputting data so the

more consistent the information, the less likely future questions will arise, since constant use of the system is remote.

If possible, select a consultant experienced in implementing the PAVER system. Selecting an inexperienced firm will increase the probability that the implementation will take longer than if an experienced firm were selected. Basic errors should be greatly reduced and the implementation should proceed smoothly.

Exposure to PAVER is a necessity. An understanding of the systems limitations is paramount when contemplating an implementation and increases as the implementation proceeds. What end results are desired? Will the system fit the needs of the activity? These questions must be answered prior to committing to the system. The PAVER system is not a one time exercise. Once the data base is established, continual updating for accuracy is necessary.

PAVER can be implemented to varying degrees. Managers should not think that the system must be implemented over the entire roadway network in minute detail. The PAVER system is extremely flexible and the degree to which it is implemented should be based on the goals to be accomplished and available funds. Also, do not rush the implementation; allow sufficient time for field work, library research, and especially, review time. Reviews to assure accuracy and completeness at each stage of the implementation are essential.

Regardless of the degree of implementation, include training of activity personnel as part of the implementation. PAVER is merely a tool and as with all tools it can be used or abused. Having trained personnel operate the system is a must. Approximately 16 to 24 hours of training should be provided for the selected staff. Inspectors should have a minimum of eight hours identifying, measuring and recording distresses.

The actual inspections, though more in-depth than those now being done at most activities, are performed on only a percentage of the network. Computer operators, those inputting and outputting data, should have a minimum of eight hours of training depending on their experience level. No training should be performed until all computer hardware and software have been procured and tested and the final report has been accepted and approved by the contracting officer.

Communicate with the consultant. Keep informed of where he is schedule-wise. Do not let your consultant get ahead while reviews are being performed. Continued data input while the data base is being checked for completeness must be avoided. Be certain your consultant fully understands what the finished product is to contain.

If a maintenance plan or prioritization/optimization scheme for repairing pavements is required, be sure the engineer is cognizant of this fact and of any administrative or funding procedures which might influence the accomplishment of the identified work.

As stated previously, the foregoing potholes are to aid future PAVER implementations. The most important one, I believe, is not knowing how the system works. Without a knowledge of system operations, implementing PAVER may not be cost effective, and therefore, not an effective management tool.

By proceeding cautiously and planning ahead, most potholes on the road to a successful PAVER implementation can be avoided. □

technical notes

departments

Repair of exterior protective coatings

Repair of exterior coatings may not be warranted with the first evidence of weathering effects, but deterioration should not be allowed to proceed to a point where damage occurs to the substrate or more costly surface preparation or coating application techniques become necessary. Interior coatings deteriorate more slowly and in a different manner.

New restrictions limiting exterior abrasive blasting at some geographical locations will significantly increase the the cost of this type of surface preparation. Thus, scheduling of repairs should be made to avoid such operations. A system of programmed painting should be followed if at all possible.

Localized areas of coating damage should be spot repaired rather than recoating the entire structure. In order to avoid imcompatibility between the old and new coating it is wise to repair with the same coating as previously used. If not identical, then a coating of very similar type should be used. If more than 40% of the coating is damaged, or if damage is related to the build up of mulitple coats, it is generally best to remove all the old coating and apply a new one.

Chalking, a common occurrence to all exterior coating, is caused by the breakdown of resin by sunlight, leaving only the powdery pigment behind. Loose chalk inhibits the bonding of topcoats and must be removed before a weathered coating is topcoated.

The two most common causes of rapid coating failure on wood are: moisture penetration from the uncoated back side or edges and build-up of multiple coats.

In the first case, structural repairs must be made to prevent water penetration behind the wood and along edges before exterior coating repairs are made.

In the second case, as each new topcoat cures and weathers, it adds additional stress to the underlying system until the total stress exceeds the bonding strength and the coating peels from the wood or from intermediate coats. Thus, it is best to avoid excessive build-up of coating thickness and to use very flexible topcoats (e.g., latex) when they are necessary. Frequently, a cleaning rather than recoating will provide the necessary cosmetic improvement.

Continued on page 32

Continued from page 31

Deteriorated coating (i.e., peeled, blistered, cracked or delaminated) should be removed by scraping, followed by sanding. Mechanical impact should be avoided as it can cause damage to sound coating. The edges of the old coating on sanded areas should be feathered to permit good adhesion of the new to the weathered coating.

The dry, sanded areas should be brush coated at a time of good weather (i.e., temperature at least 5° above dewpoint and in recommended range). An oil-based primer is preferred to latex primer as the former has better wetting and penetration properties.

Fire and smoke damaged coating should be cleaned of surface deterioration and treated like wood knots, i.e., they should be sealed with a varnish or shellac and then coated as if they were new surfaces.

Concrete and masonry substrates generally are less severely affected by coating deterioration than wood or steel substrates because they neither expand excessively nor corrode. Two important causes of coating failure on concrete/masonry structures are efflorescence and spalling of concrete by freezing and thawing.

Efflorescence is the deposition of water soluble salts on the surface from moisture migrating through the substrate. If the source of the moisture is a leak in the roof, then necessary structural repairs should be made. When moisture migrates through a concrete/masonry wall from an environment of higher to one of lower humidity, the surface of the high humidity side should be sealed.

Another way to prevent efflorescence is to drill vent holes to allow the escape of entrapped moisture. In any event, any efflorescence or laitance (alkaline material floating to the surface of newly poured concrete) must be treated. As much as possible is first removed with a clean dry wire or stiff bristle brush. The surface is then scrubbed with a 5 to 10% solution of muriatic (hydrochloric) acid, rinsed with water, and allowed to dry. Rubber gloves and eye protection are used while handling the acid, and higher concentrations of acid are diluted by pouring the acid into the water rather than vice versa. The acid solution is normally mixed in a glass or porcelain enamel container as it reacts with most metals. The acid is not allowed to remain on the concrete for more than five minutes, and no more than four square feet of concrete are cleaned at any one time.

If mold is present on the concrete/masonry, it must be removed by scrubbing. Rubber gloves and eye protection should be used to prevent burns from the caustic solution used.

Structures to be waterproofed (e.g., swimming pools, showers, etc.) are usually coated with TT-P-95, Type I. For structures where appearance is the chief consideration, a latex material (e.g., TT-P-19 or TT-P-55) that permits "breathing" (passage of water vapor) is used.

Pinpoint rusting is usually the first sign of coating failure on steel. It is caused by incomplete coverage of steel (holidays) during coating application or by erosion of the coating.

Blistering of coating may be caused by surface contamination, solvent entrapment, or cathodic disbonding. If the blisters are unbroken, the underlying steel may still be protected. If bare steel is exposed through broken blister or by impact or abrasion damage, the resultant corrosion of the exposed steel may undercut the coating. Undercutting is minimized with inhibitive pigments (e.g., zinc dust) and good coating adhesion. Damage to exposed substrate occurs much more rapidly to steel than wood or concrete/masonry, and thus, requires more immediate corrective action.

All loose peeling or blistering coating should be removed by scraping before cleaning the exposed steel. The remaining coating should be tightly adhering. The preferred method of surface preparation of the steel is abrasive blasting. The steel should be blasted with a fine abrasive (e.g., minus sixty mesh grit) and the nozzle then held 3 to 4 feet from the surface at a low angle to blast a feathered edge on the tightly adhering surrounding coating without damaging it excessively. (Weathering of a repaired coating is usually initiated at the edges of the patch.) Coarse abrasive blasting or mechanical cleaning may loosen the remaining coating or cause it to star crack. Power sanding can be used on small localized areas.

The primer used in coating repair must wet the steel surface well and be compatible with the existing coating. Brushing the primer aids in achieving the necessary penetration of the steel profile and the pores of the feathered coating. Chemically cured coatings (e.g., epoxies and coal tar epoxies) are difficult to topcoat as their surfaces are not penetrated by topcoat solvent. Such surfaces should be lightly sanded and given a thin tie coat before a full coat of the appropriate topcoat is applied.

The initial sign of failure of zinc-rich coated and galvanized steel surfaces is usually the same as coated steel surfaces (pinpoint rusting). They are repaired, however, somewhat differently.

In order to achieve adequate surface cleaning while retaining as much zinc as possible, the surfaces should be sweepblasted (i.e., SSPC-SP-7 brush-off blast cleaned) to remove all surface rust. Water blasting by a licensed contractor has also been used successfully. Power sanding can be used on small localized areas. If loss of zinc or corrosion of steel had been allowed to proceed to an advanced state, the surface should then be treated as weathered steel.

If a weathered zinc-rich coating is not topcoated, it should be repaired with a similar zinc-rich coating. If it has an organic topcoat, it is necessary to use a compatible zinc-rich organic coating to maintain the zinc-rich undercoat and bond to the feathered organic topcoat. Galvanized steel should be coated as described in Table 16 of NAV FAC MO-110.

Additional information may be obtained from Richard W. Drisko, Code L52, Naval Civil Engineering Laboratory, Port Hueneme, CA 93043; Autovon 360-4234, and (805) 982-4234.

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Naval Base
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Lt. Robert D. McClure
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Bldg. 1, Naval Base
Great Lakes, IL 60088
Phone: (312) 688-6955/6
AV 792-6955/6

LCdr. John A. Fessler
Western Region, RNCF
1220 Pacific Highway, Suite 203
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Or, contact an Active Duty EFD Accessions Officer listed on the inside front cover for further information and details . . .

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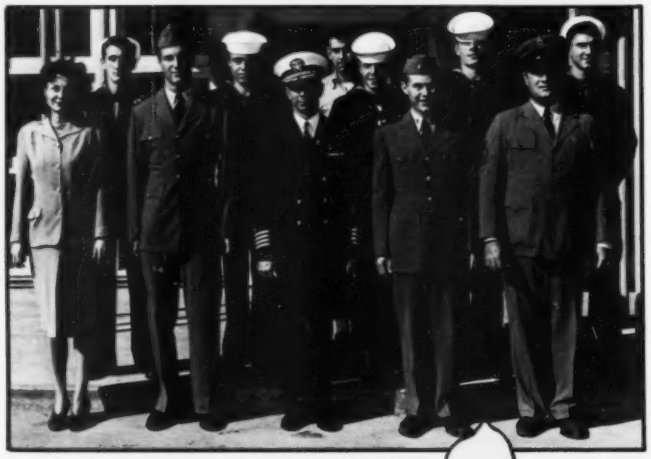
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